Prosperity or Perdition:
Do Lines of Operations Apply in Stability Operations?

A Monograph
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14. ABSTRACT

Conflict in the twenty-first century involves a complex interaction of variables. Equally complex are modern stability operations that occur concurrently or immediately following war or combat operations. This study examines planning methodology for stability operations, focusing on the specific doctrinal planning construct of ?lines of operation?, one of the ?Elements of Operational Design? contained in the US Army?s Field Manual 3-0, Operations. The monograph first traces the historiography of the term ?lines of operations? and examines its development from an essential geographical principle of linear warfare to a cognitive tool for modern planners. Included in this analysis is an evaluation of military operational theory, general systems theory, emerging ideas associated with complexity theory, and problem solving constructs based on nonlinear principles. To evaluate the suitability of the lines of operation planning construct, the monograph examines a notional future case study involving the participation of US armed forces in a hyper-complex ?multinational, joint, and interagency stability operation in the nation of Colombia. Colombia offers a feasible scenario because of the current diplomatic, economic, and military engagement, combined with a potential increase of all three areas in the near future. The case study develops two operational level courses of action; one applies the ?lines of operation? construct, and the other applies a planning matrix, which considers the aspects of emerging theories and nonlinearity discussed in the monograph. The case study reveals that ?lines of operations? is, and will continue to be, an enduring part of the military lexicon regarding the geographic orientation of an armed force. Additionally, as a planning construct, it is a useful method for visualizing and developing operational plans. However, when applied to hyper-complex operations, the suitability of ?lines of operation? as a planning construct decreases relative to an increase in the amount of complexity present in the military problem. The monograph recommends the development of a holistic planning construct that merges current operational planning constructs?based on linear and nonlinear principles? with twenty-first century information-based tools and technology. Additional recommendations address steps to be taken in the areas of doctrine, training, and education, in order to improve the ?lines of operations? planning construct and the overall approach to complex military problem solving at the operational level.

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Abstract

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CHAPTER 1

Introduction

The US Army conducts full spectrum operations to accomplish missions in both war and military operations other than war (MOOTW). Operational situations that involve high intensity combat, small-scale strike operations, international peace treaty enforcement, or humanitarian relief operations are difficult missions in their own right. The possible combination of two or more of these types of operations further increases the complexities across the entire spectrum of conflict. The Contemporary Operating Environment (COE) is a direct reflection of these complexities.[1]

During planning for operations in the COE, modern military planners consider a myriad of factors when formulating courses of action (ways) to employ military forces (means) in support of national policy objectives (ends). The most significant and unifying source of guidance for military planners is doctrine. The current doctrinal planning construct—thatis applied in both war and MOOTW—used by US Army planners are the Elements of Operational Design. A key component of operational design, as explained in the 2001 version of Field Manual (FM) 3-0, *Operations*, is the concept of lines of operations.[2] The purpose of this monograph is to analyze and assess the suitability of using lines of operations as a planning

[1] The US Army Training and Doctrine Command (TRADOC) defines COE as "the overall operational environment that exists today and in the near future (out to the year 2020). The range of threats during this period extends from smaller, lower-technology opponents using more adaptive, asymmetric methods to larger, modernized forces able to engage deployed U.S. forces in more conventional, symmetrical ways. In some possible conflicts (or in multiple, concurrent conflicts), a combination of these types of threats could be especially problematic." A good source of information is the US Army Center for Lessons Learn (CALL) COE Handbook, found at: http://call.army.mil/Products/ctc/COE-handbook/coe.htm. A more comprehensive official view of the COE can be found in *Future Operational and Threat Environment: A View of the World in 2015.* Fort Monroe, VA: US Army Training and Doctrine Command, 12 April 2000. This twenty-page pamphlet, along with other capstone doctrinal publications like FM 3-0 *Operations*, has and will continue to influence Army doctrine, training, leadership, education, organization, and planning for the next generation. It is based on four assumptions: nation-states will remain principal actors, continued military and economic dominance of the US, imbalance between developing and developed nations, and increasing power of non-state organizations.

[2] Field Manual 3-0, *Operations*, (Headquarters Department of the Army, Washington: GPO, June 2001), 5-6 – 5-12. The complete list of the elements of operational design are: End state and military conditions; Center of gravity; Decisive points and objectives; Lines of operations; Culminating point, Operational

construct for US Army stability operations in an increasingly complex operating environment. Linked to this purpose is an analysis of new or modified constructs, based on emerging theories, that may refine or replace existing constructs in the execution of stability operations at the operational level of war or MOOTW.

Definition of Key Terms

Numerous authors and strategic experts have analyzed the components of this emerging contemporary operating environment, each defining it similarly but referring to it by different names. This monograph refers to military, diplomatic, informational, and economic activities that occur in this emerging environment as the Hyper-Complex Operations (HCOs). This term is a derivation of an existing term—Complex Contingency Operations. Complex Contingency Operations were formally expressed in William J. Clinton's Presidential Decision Directive (PDD) - 56, titled "Managing Complex Contingency Operations." A direct result of critical shortcomings in the areas of command, control, and coordination during operations in Somalia, Haiti, and Bosnia, PDD-56 was an attempt to achieve unity of effort through interagency coordination. PDD-56 addressed key concepts of interagency coordination at the strategic, operational, and tactical levels during peace operations, domestic humanitarian assistance, and foreign humanitarian intervention. It did not address the MOOTW missions where direct combat is more likely—counter-terrorism, support to counter drug operations, counter-insurgency operations, or foreign internal defense involving combat operations. The US Army refers to these different missions as stability operations.[3]

HCOs shares many characteristics with Complex Contingency Operations and Complex Humanitarian Emergencies, but are unique because:

- In an HCO, the civil conflict that is rooted in economic, ethnic, tribal, or religious animosities takes place within a government that the US supports. These animosities

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reach, approach, and pauses; Simultaneous and sequential operations; Linear and non-linear operations; and Tempo.

[3] A good summary of PDD-56 and its strengths and weaknesses can be found in: William P. Hamblet and Jerry G. Kline, "Interagency Cooperation: PDD 56 and Complex Contingency Operations," *Joint Forces Quarterly* (Spring 2000), 92-97. Also, see FM 3-0, 9-8.

generally result in atrocities and/or unconventional acts of terror from various groups and spheres of power.

- The friendly national government has diminished or no control in some or all portions the state. This lack of control allows local warlords, political, or criminal groups to seize power in regions of non-governmental influence. These threats to sovereignty result in the alternate economic activities (i.e. illegal drug, arms, or rare gemstone trading) and create the potential for the influx of international terror groups.
- Finite tasks, objectives, or an end state do not necessarily define plans or planning in HCOs. Agreeable or satisfactory conditions (e.g. an insurgency still present in nation but no longer threatening state sovereignty or illegal drug production remaining within a "tolerable" level) have primacy in planning for HCOs. Measures of effectiveness, in the planning and execution process, are critical to defining the satisfactory conditions that are the focus of HCOs. [4]

Within this unique environment, US forces must conduct a combination of missions that are at the violent spectrum of stability operations. The ultimate goal of US forces conducting HCOs is support (diplomatic, informational militarily, and economic) of a failing friendly state.

The terms military theory, military doctrine, and military planning, are used throughout this monograph and require some specific definition. *Military theory* is a reliable system of beliefs about the nature of conflict or war that is professionally justified (either by soldiers or civilians).[5] Essentially, all military theory addresses the fundamental question: How does war and conflict work? A military theory is different from a general scientific theory in that it cannot be refined by repetitious testing in a controlled environment; the value or utility of a military theory is decided in the crucible of armed conflict, not in a lab or classroom.

Military doctrine is the sum total of fundamental principles by which military forces guide their actions in support of national objectives. Military doctrine—to be effective—is authoritative but requires judgment in application.[6] Military doctrine is the application of military theory; it explains how a military force, within a certain situation, will defeat its enemies.

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[4] Andrew S. Natsios, *U.S. Foreign Policy and the Four Horsemen of the Apocalypse: Humanitarian Relief in Complex Emergencies* (Westport, Connecticut: Center for strategic Studies, 1997), 7. The author explains five characteristics of Complex Humanitarian Emergencies, some similar to HCOE.

[5] James J. Schneider, *How War Works: The Origins and Purpose of Military Theory*, (Fort Leavenworth, KS: US Army Command and General Staff College School of Advanced Military Studies, 16 June 2001), 9.

[6] Joint Publication 1-02, "DOD Dictionary of Military and Associated Terms.As amended through 14 August 2002.

Effective military doctrine unifies a military force, providing a sound basis for recruiting, training, educating, organizing, and equipping its personnel.

Military planning takes place at all levels of military operations (strategic, operational, and tactical) and is a process to solve problems and achieve objectives. Strategic level planning is primarily the realm of senior government officials, with strategic military planning being a sub-set in support of a nation's overall strategy.[7] Operational planning and operational planners—the primary focus for this study—deal with the use of military force to achieve strategic goals. Current US Army doctrine explains that operational level commanders and planners work to support strategic objectives through operational design and "begin [planning] with a clean sheet of paper."[8] In his article, "What if We Fight Tonight? Advanced Military Education for the Twenty-first Century", Dr. James Schneider provides a more thorough and eloquent definition of a military plan and the military planning process. He states:

> A military plan is the 'crystallization' of the will of the commander in his attempt to control the future by subjecting it to his will. The commander's will is the prime mover of all military operations. It is the engine of all action. The motive force of the commander's will, in its crystalline form, is cut and polished by the planning staff. The plan, sharp and diamond-hard, cuts through the present and into the future. A flawed plan, like a flawed diamond, will shatter in its 'cut' with the rock-hard reality that marks planning execution in a deadly environment.[9]

Ultimately, military planning, in all its forms, takes into account military theory and doctrine and applies it during a resource-constrained environment.

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[7] Henry Mintzberg, *The Rise and Fall of Strategic Planning: Reconceiving Roles for Planning, Planners* (New York: The Free Press, 1994), 12.
[8] Field Manual 5-0, *Army Planning and Order Production*, (Headquarters Department of the Army, Washington: GPO, 15 July 2002), 1-11.
[9] James J. Schneider, "What if We Fight Tonight? Advanced Military Education for the Twenty-First Century," (Fort Leavenworth, KS: US Army Command and General Staff College School of Advanced Military Studies, 15 February 1995), 4.

Methodology and Organization

This monograph begins with a short introductory chapter, followed by a second chapter that examines the historiography of the term “lines of operations” as it relates to military theory and practice. Chapter two also includes a review and analysis of the doctrine that transformed lines of operations into a construct for operational level planning. Chapter three examines the influence of operational and systems theories on current operational planning. This examination also considers emerging theories that seek to explain the behavior of modern complex systems and activities. Additionally, this chapter demonstrates how these emerging theoriescan be applied to certain aspects of modern military planning. Chapter four addresses a planning case study and how the theories discussed and developed in Chapter three would apply to the case study. The case study scenario addresses the myriad of complexities (strategic, political, military, social, economic, etc.) that would be involved in the conduct of large-scale stability operations in the country of Colombia. The analysis in Chapter four provides supporting evidence to answer the primary and supporting research questions. Chapter five draws final conclusions from previous chapters (2,3, and 4) and develops recommendations to improve US Army operational planning procedures.

Scope

Although joint doctrine is referenced and the complexities associated with interagency coordination are discussed, the monograph primarily considers US Army planning doctrine. Another doctrinal limitation is the purposeful omission (except to put them in context with lines of operations) of the other elements of operational design. This omission allows for a detailed analysis of lines of operations as a feasible planning construct duringHCOs; each of the other elements requires further analysis and study to determine if they are relevant to future operational level commanders and planners during stability operations.

A notional case study is used in the monograph as a mechanism to examine theoretical and doctrinal planning concepts and constructs; it is not intended to be a deliberate campaign

plan. The monograph case study involves American participation—as part of a Combined Joint Task Force (CJTF)—in future stability operations that involve direct combat (e.g. foreign internal defense [FID], counter-terrorism [CT], and counter drug [CD] operations) within the country of Colombia in order to bring about favorable strategic and political conditions in the US and the western hemisphere.

The current geo-strategic situation may not justify the commitment of conventional US forces directly in Colombia or any other Latin or South American nation. However, this situation could change. The US government is continuing to assess the threats posed to the US homeland by terrorist groups operating in failing or failed states. President George W. Bush addresses the components of this new geo-strategic environment in the September 2002 *National Security Strategy of the United States.* This new policy document provides clear guidance regarding the conduct and nature of future full spectrum operations, particularly those thatwill be conducted against non-traditional or non-state enemies.[10] President Bush initiated the current US involvement in Afghanistan (Operation ENDURING FREEDOM) to destroy Al Qaeda terrorists and deny the future use of Afghanistan as a safe-haven for terror groups of global reach. The denial of a similar terror safe-haven in the western hemisphere would be a difficult and complex operation. US Army operational level commanders and planners should consider this feasible contingency within the planning constructs that are part of current doctrine. The specific examination of lines of operations as a road map for planning this notional operation may assist in determining if current planning doctrine will lead the US Army to a path of prosperity or perdition in Colombia or a similar type of hyper-complex stability operation in the future.

[10] *The National Security Strategy of the United States of America* (September 2002 Washington, DC: The White House). In addition to providing clear guidance on future stability operations, this new policy document marks a fundamental shift in the use of military force for the US, formally announcing a policy of preemption. This major policy shift has significant implications regarding not only offensive and defensive operations, but also stability and support operations. This pointis addressed later in the monograph.

CHAPTER 2

> If the art of war consists of brining into action upon the decisive point of the theater of operations the greatest possible force, the choice of the lines of operations, being the primary means of attaining this end, may be regarded as the fundamental idea in a good plan of a campaign.
>
> Antoine-Henri Jomini[11]

Introduction

Many words and phases used by modern military professionals are based solely on 21st century capabilities or issues (e.g. network centric warfare and common operating picture). However, certain words or phases have served as threads of continuity—independent of changes in technology, organization, and location—in the evolution of military theory and practice. One such phase is "lines of operations." The etymology of the term "lines of operations" reveals that it has been part of professional military discourse for over three centuries.

The purpose of this chapter is to examine the history of the term "lines of operations". Additionally, this chapter will trace how the term has evolved from a concept associated with geographic orientation to a doctrinal planning construct. A clear understanding of the term, and its associated history, is critical to determine if "lines of operations"—either as a geographic term or as a planning construct—can be applied to hyper-complex stability operations.

Geographic Lines of Operations

Military thinkers and soldier-theorists during the eighteenth century were unified in an effort to identify and define a rational set of principles (based primarily on quantifiable data) for the conduct of war. This data came in many forms: topographical measurements, firing rates of formations, and march-tables of armies. Another type of quantifiable data, the geometrical relationship between the front of an army to its base(s) of supply formed the foundation of the initial concept of lines of operations.

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[11] Antoine-Henri Jomini, *The Art of War*, translated by G.H. Mendell and W.P. Craighill's with an Introduction by Charles Messenger (London: Grennenhill Books, 1992; reprint of J.B. Lippencott & Co 1862 edition), 114.

An Englishman, Henry Lloyd (1720-1783), was the first to use the term "line of operations" in a published work.[12] Lloyd's concept of lines of operations, explained in his 1781 *Military Memoirs*, primarily addresses the ordering of troop formations (i.e. first line of operation oriented north and the second line of operation oriented east) on the battlefield. This ordering of formations by Lloyd fits into a larger systemic discussion of warfare that focuses on a single principle: "an undivided army, moving on a single line of operations kept as short and safe as possible, can hope to avoid defeat."[13]

In 1805, a Prussian, Heinrich Dietrich von Bülow (1757-1807) continued Lloyd's analysis of lines of operations in a military treatise titled *Lehrsaetze des Neueren Krieges (Innovative Theories of War)*. Bülow plainly explains the term lines of operations by stating: "the existence between the subject of the operation and the object of the operation of a space through which the army must move gives the concept of the 'line of operation'."[14] This definition of the term fit within Bülow's broader "geometric" understanding of war. Bülow's view—a common 18th century attempt to reduce the conduct of war to a quantifiable activity, like one of the natural sciences—defined all aspects of military affairs during the historical period of overlap between dynastic and national warfare.

Despite Lloyd and Bülow both stressing that the concept of lines of operations fits into a larger set of "certain and fixed principles" that governed war, it was the 19th century writings of a Swiss (who fought in the service of France) that exposed the term and concept to a wider audience. Antoine-Henri Jomini's writings on *lignes d'operations* would shape and define the concept of lines of operations well into the 20th century.

Jomini is considered to be one of the most outstanding strategists and theorists in Western military history, and his major work, *Precis de l'Art de la Guerre* (The Art of War) is arguably

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[12] Michael R. Matheny, "The Roots of Modern Operational Art," [on-line]; available at http://carlisle-www.army.mil/usawc/dmspo/staff%20publications/modern_operation.pdf; Internet; accessed 20 October 2002, 20.

[13] John Shy, "Jomini," *Makers of Modern Strategy: From Machiavelli to the Nuclear Age*, ed. Peter Paret with Gordon A. Craig and Felix Gilbert (Princeton, NJ: Princeton University Press, 1986), 149.

one of the most influential books on the topic of warfare.[15] Born in (the French speaking city of) Payerne, Switzerland in 1779, Jomini worked as a banker in Paris and in 1798 joined Napoleon's army. He retired in 1801 and began a career in writing, authoring an analysis of the campaigns of Frederick the Great. In 1804, he returned to the French Army and was present at the key battles of Austerlitz (1805) and Jena (1806). Jomini was also in the German campaigns of 1813, but changed sides to the Russian Army in 1814. He served numerous Russian leaders and many of his professional writings were produced during his period of Russian service. Jomini moved to Paris after the Napoleonic wars, returned briefly to advise the Russian czar during the Crimean War (1853-56), and died in 1869.[16]

Jomini's initial discussion of *lignes d'operations* (lines of operations) is conceptually similar to that of Lloyd and Bülow. In *The Art of War*, Jomini states that: "In every case, each theater must have its own base, its own objective point, its zones and lines of operations connecting the objective point with the base . . . ."[17] This view of warfare remained essentially linear focused, with the ideal Jominian battlefield diagram being geometric and discrete. See Figure 1.

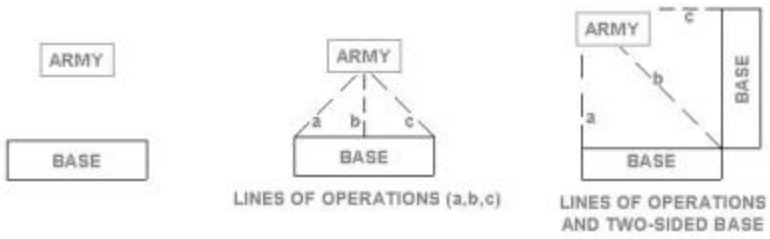

Figure 1-1. The Jominian Battlefield

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[14] Heinrich von Bülow, *Lehrsaetze des Neueren Krieges*, (Berlin: Froelich, 1805), 27; quoted in James J. Schneider, "Theoretical Paper No. 3," *The Theory of Operation Art* (Fort Leavenworth, KS: US Army Command and General Staff College School of Advanced Military Studies, 1988), 30.

[15] The most available English version of Jomini's *Precis* is the Greenhill Book's reprint of the 1862 (Philadelphia: J.B. Lippencott & Co.) translation–*The Art of War*, with an Introduction by Charles Messenger (London: Grennenhill Books, 1992). A detailed analysis of Jomini's writings and their significance to military thought and practice can be found in John Shy's, "Jomini," *Makers of Modern Strategy: From Machiavelli to the Nuclear Age*, ed. Peter Paret with Gordon A. Craig and Felix Gilbert (Princeton, NJ: Princeton University Press, 1986).

[16] Additional biographical information on Jomini can be found in John I. Alger's *Antoine-Henri Jomini: A Biographical Survey* (West Point, NY: USMA Press, 1975).

[17] Jomini, 76.

Jomini views lines of operations as not only a concern for the commander to manage in the offense, but also as a source of vulnerability. Lines of operations, along with lines of communications (logistical and administrative routes), must be protected in order to ensure victory.[18] Additionally, Jomini explains that lines of operations are separated by distances that contain significant or decisive points (i.e. rivers, mountains, as well as forts and road intersections). When decisive points are connected and viewed in relation to a line of operation, they become intermediate objectives, and formed additional linkages from an army's base to its objective.

Jomini further develops the concept of lines of operations, again in clear geometric terms, by explaining the significance of "interior" and "exterior" lines of operations. The Swiss theorist examines the battles of Frederick the Great (specifically Frederick's 1757 victory over the Austrians at Leuthen) and the campaigns of Napoleon Bonaparte, concluding that "interior or central lines will be preferable to exterior lines, since in the former case the fractions of the army can be concentrated before those of the enemy, and may thus decide the fate of the campaign."[19] This simple causal relationship between interior lines of operations and success in battle forms a significant element of Jomini's fundamental principle (sub-divided into four maxims), which stresses that:

> that a commander should seize the strategic initiative [Offensive]; should maneuver so as to impede the enemy's lines of communication and supplies without endangering his own [Objective]; should concentrate the bulk of his forces against the decisive point, taking care to attack only a portion of the enemy's forces [Mass]; should achieve victory by use of mobility and

[18] James J. Schneider, "Theoretical Paper No. 3," *The Theory of Operation Art* (Fort Leavenworth, KS: US Army Command and General Staff College School of Advanced Military Studies, 1988), 24. Schneider explains that during the Napoleonic era a line of communication was broken down into two sub-elements: main supply routes and lines of operation. There is a distinction because in some cases, supply units could not travel along the same routes as combat formations. In his definitive work *On War*, Carl von Clausewitz writes about lines of communication (Chapter Sixteen of Book Five) in essentially the same linear and geometric manner as Jomini's lines of operations. Clausewitz's non-linear view of warfare will be discussed later in this monograph.

[19] Ibid., 117.

> surprise; and should follow rapidly in pursuit of the defeated foe [Maneuver][20]

Despite devoting thirty pages (the entire Article XXI in Chapter III of *The Art of War*) to this relatively simple concept, Jomini's writings remain the most significant source of confusion regarding the concept of lines of operations. This lack of clarity regarding lines of operationscan be attributed to two particular shortcomings inJomini's *The Art of War.* The first problem is that Jomini creates an excessive amount of sub-categories of lines of operations; he names and defines twelve different types of lines of operations, ultimately resulting in confusion rather than clarity.[21]

The second source of confusion regarding Jomini's use of lines of operations is his linkage to the term "strategic lines of maneuver." This linkage is most likely a result of Jomini's amalgamation of what is now referred to as the separate and distinct strategic and operational levels of war.[22] The term that resulted—"maneuver lines of operations"—actually addressed key planning decisions that a (combined strategic and operational level) leader had to make regarding where his army had to fight, what type of forces should be used, and what objectives had to be attained in order to achieve a favorable strategic outcome.[23] Although this conceptual idea (i.e. linking military tasks at the operational level to strategic ends) is essentially a template for operational level planning, it has "puzzled and exasperated" military professionals because of Jomini's choice to link the concept with the term "lines of operations."[24] It has taken the US Army almost two centuries to realize Jomini's dual concept of lines of operations (both in the geographic orientation of an armed force and as a planning construct) and to formalize it in its planning doctrine.

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[20] Richard A. Preston, Alex Roland, and Sydney F. Wise, *Men in Arms: A History of Warfare and its Relationships with Western Society*, Fifth Edition (Fort Worth, TX: Harcourt Bruce Jovanovich College Publishers, 1991), 182.
[21] The sub-categories of lines of operations named by Jomini in Chapter III of *The Art of War* are: simple, double, interior, exterior, concentric, divergent, deep, maneuver, secondary, accidental, provisional, and definitive; Jomini, 100-104.
[22] Schneider, 14-15. Dr. Schneider argues that the operational level of war did not exist until the campaigns of the US Civil War. Before this time (particularly during the Napoleonic campaigns) the leader also served as the army field commander. This was the case with Frederick and Napoleon, the two primary individuals examined by Jomini.
[23] Shy, 166.
[24] Ibid.

Logical Lines of Operations

The formulation of tactical doctrine from unique and specific strategic conditions is not a new phenomenon in warfare. The German Army in World War I, when faced with a strategic stalemate on the Western Front, perfected a new tactical doctrine of infantry infiltration techniques (storm troop tactics) in an attempt to gain a series of decisive victories and ultimately end the war on strategically favorable terms. Another example of this phenomenon was the Eisenhower administration's "New Look" strategy and policy of mutually assured destruction that drove the US Army's development of tactical nuclear doctrine during the 1950s.[25] However, the formal translation of strategic concepts and ideas into published operational doctrine is a relatively new phenomenon in the US Army. A review of the recent history of the US Army's "capstone" doctrinal publication—FM 100-5, *Operations*—demonstrates the rapid theoretical and doctrinal evolution that transformed lines of operations from an aspect of the Jominian geometric battlefield to a construct of operational planning in US Army doctrine.

The strategic concerns of fighting a numerically superior Soviet Union, the lessons learned from high intensity tank warfare during the 1973 Arab-Israeli War, and the significant psychological impact of the Vietnam War, defined the environment that senior Army leaders faced in the early 1970's. One of these senior leaders, General William E. DePuy, played a major role in the development of a unifying and holistic approach to doctrine in the Army. What resulted was the 1976 version FM 100-5, a significant departure from previous US Army versions of FM 100-5. Depuy's primary goal when transforming FM 100-5 was to produce a manual that "attempted to present an overarching concept of warfare that would rationalize everything the Army did, from training recruits to designing tanks, in terms of how the Army intends to fight."[26]

DePuy's manual did accomplish its purpose—producing a fundamentally new role for doctrine and forcing the Army to move in a direction towards a twenty-first century

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[25] Geoffrey Perret, *Eisenhower* (New York, NY: Random House, 1999), 457-458.
[26] Paul H. Herbert, *Deciding What Has to Be Done: General William E. DePuy and the 1976 Edition of FM 100-5, Operations*, Leavenworth Papers 16, Combat Studies Institute (Fort Leavenworth, KS: US Army Command and General Staff College, 1988), 1.

force—however, its focus was primarily on the tactical level of war and it did not address planning in any significant manner. The 1982 version of FM 100-5 addressed the "tactically focused" shortcoming by formally recognizing the operational level of war. Thiswas followed shortly by another version of FM 100-5 in 1986 that marked a "quantum leap in operational cognition" and its relationship to operational planning.[27]

The quantum leap that was present in the 1986 version of FM 100-5 was the concept of operational art. The manual defined operational art as: "the employment of military forces to attain strategic goals in a theater of war or a theater of operations through the design, organization, and conduct of campaigns and major operations."[28] Although the Russians and Germans were considering the factors that led to the development of operational art as early as the 1920's, the US Army groped through campaign design and planning for most of the 20th century. This recognition and understanding of operational art served as the Rosetta stone that allowed the US Army to collectively apply operational concepts like center of gravity, decisive points, and lines of operations in a manner that would fundamentally change US Army planning.

Interim supporting doctrine like the 1995 version of FM 100-7,*Decisive Force: The Army in Theater Operations*, incrementally improved the constructs of operational art and planning by introducing the specific "Concepts of Theater and Operational Design" and "Key Elements of Theater and Operational Design."[29] However, it was the publication of the 2001 version of *Operations*—now called FM 3-0 (using the Joint doctrinal numbering system)—that introduced a new way to apply the concept of lines of operations.

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[27] Shimon Naveh, *In Pursuit of Military Excellence: The Evolution of Operational Theory*, (London: Frank Cass Publishers, 1997), 305. Naveh argues that this version of FM 100-5 marked a significant step in operational theory and that the concepts contained in the manual were proven in the Gulf War (case study).
[28] FM 100-5, *Operations*, (Headquarters Department of the Army, Washington: GPO, May 1986), 10.
[29] FM 100-7, *Decisive Force: The Army in Theater Operations*, (Headquarters Department of the Army, Washington: GPO, May, 1995), 3-0 and 3-2.. The "concepts" listed on page 3-0 are: Center of gravity, Decisive points, Lines of operation, Culminating Point, Indirect approach, Positional advantage and strategic concentration of forces, and Deception. The definition of lines of operation in this manual remained in Jominian geometric terms. The "elements" listed on page 3-2 are: Objective, Sequence of operations and use of resources, Phases, Branches and sequels, Sequential and simultaneous warfare, and Logistics.

The post-Cold War strategic environment, like that of the post-Vietnam strategic environment, required the US Army to re-evaluate its capstone doctrinal publication. One of the most significant constructs that emerged from the Army's strategic and doctrinal analysis was recognition of the importance of "visualizing" the conduct of full spectrum (war, conflict, and peace) operations before they occur.[30] This full spectrum consideration had a significant impact on the primary construct used by operational level leaders and planners to translate a vision into a plan—the elements of operational design. One specific element of operational design—lines of operations—evolved into another construct all together.

FM 3-0 initially explains and defines lines of operations in familiar linear terms, specifying geographic, interior, and exterior examples. It also proposes a new construct concerning the term; commanders and planners may also visualize campaigns along "logical lines of operations."[31] This planning construct is rooted in the practical planning and coordination lessons learned by Army leaders and planners during numerous post-Cold War stability and support operations, where US Army units performed a significant amount of missions outside the traditional realm of attack and defend tasks. This planning construct primarily concerns a cognitive and causal linkage (i.e. cause and effect) rather than a geometric or linear relationship between an army and its objective(s). Ultimately, the performance of a series of tasks (sometimes not necessarily military related) will lead to a favorable operational end state and mission accomplishment. See Figure 2-1.

[30] FM 3-0, 5-3.
[31] Ibid., 5-9.

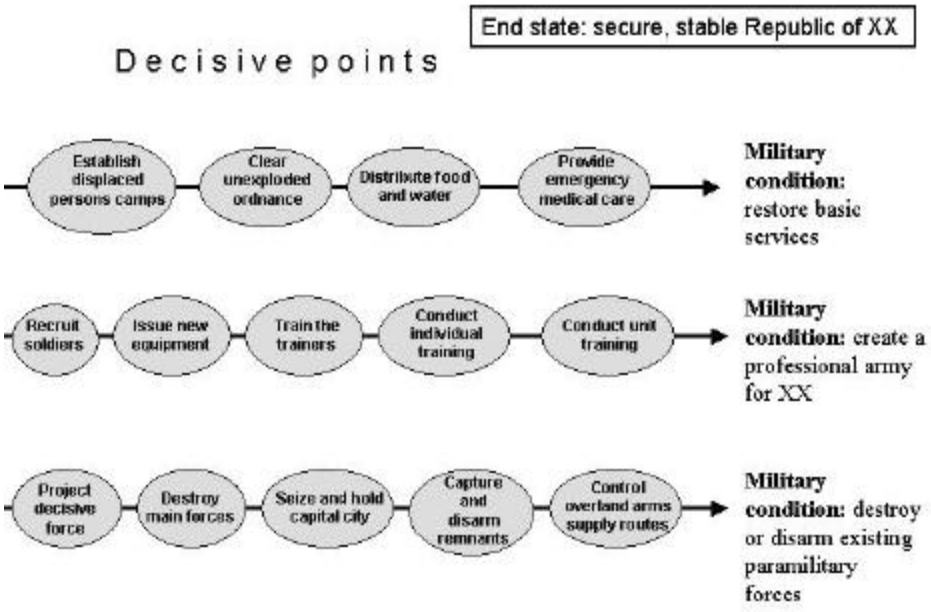

Figure 2-1. Logical Lines of Operations[32]

Currently, senior US Army leaders are enamored with the term lines of operations and apply the construct as a planning tool for activities or events that are not necessarily operational level exercises or deployments. One example of this expanded use of the construct is the integration of lines of operations as part of the US Army's Transformation Campaign Plan (TCP). The TCP is the US Army's strategic level planning and synchronization tool to guide the entire Army towards the ultimate goal of transformation—the Objective Force. The TCP is organized along three axes: trained and ready, transform the operational force and transform the institutional Army. These axes are further divided into 14 functional lines of operations to assist in the development and execution of the campaign plan. The lines of operations describe closely related activities that link objectives, decisions, and milestones in time and purpose.[33]

[32] Ibid.
[33] LTG [now GEN] Larry R. Ellis, "The Transformation Campaign Plan: The Tool to Transform the Army," *Army Magazine* (October 2000); [on-line]; available from http://notes.tetratech-ffx.com/army_transformation_peis/oct2000.htm; Internet; accessed 15 November 2002.

Conclusion

This review of the history and doctrine regarding the term lines of operations explains that it is a well developed concept and construct in the US Army—albeit a source of considerable confusion—and it has utility in the tactical or operational orientation of a force (geographic), as well as a construct for operational level planning (logical). However, this does not guarantee that the concept of lines of operations is suitable, particularly as a planning construct, for the future operations. Future US Army operations, particularly stability and support operations (SASO), involve an exponential increase in variables and unforeseen relationships. The complex factors associated with future operations may decrease the effectiveness of current planning constructs to accurately apply military force to support strategic policy. In order to test the suitability of current planning constructs, specifically lines of operation, a comprehensive analysis of Army SASO doctrine relating to operational planning is required. This analysis must include an examination of emerging theoretical concepts, that can improve or augment operational level commanders and planners ability to effectively visualize and plan future complex stability operations.

CHAPTER 3

> If we want to deal rationally with a complex problem, then the first thing that we do (tentatively, at least) is define our goals clearly. Then we construct a model of the specific reality or modify an existing model. We may have to observe the system for a while to understand the connections between its variables and need to gather information on the present state of the system so that we know how it is behaving now and it is likely to behave in the future. Once we have done all that we can move on to the planning stage.
>
> Dietrich Dorner, *The Logic of Failure*[34]

Introduction

Army and joint planning doctrine, like all forms of US military doctrine, is a function of fundamental principles and experience combined with a theoretical basis of thinking. This chapter examines the influence that the scientific revolution, industrial revolution, and information revolution has had on military planning. This analysis is important because it demonstrates not only the past influence of theoretical development on military doctrine; it provides an examination of how emerging theories (specifically complexity theory and nonlinear principles) may influence future military planning doctrine.

Equation Based Planning: Operational and Systems Theory

The construct of lines of operations, and all associated current military planning, is derived from a confluence of events, beginning in the seventeenth century and extending into modern times, that has linked science (and the scientific method) with military operations. This relationship has led military theorists to develop a series of trial and error techniques in an attempt to understand and eventually more effectively pursue war and armed conflict. Most contemporary military theorist and professional believe that modern military operations, in fact all forms of human endeavor in Western civilization since the seventeenth century, have been

[34] Dietrich Dorner, *The Logic of Failure* (Germany: Rowohlt Verlang GMBH, 1989 under the title *Die Logik des Misslinggens*; reprint, New York: Metropolitan Books, 1996), 153.

based on a "cause-and-effect" relationship which is the single most important characteristic of the scientific method and Newtonian science.[35]

Advances in technology improved tactical firepower during the US Civil War through World War I gave the defense primacy over offensive maneuver, causing extensive theoretical thought among various military thinkers from different countries and nationalities. Inter-war theorist like J.F.C. Fuller, B.H. Liddell Hart, Giulio Douhet, William "Billy" Mitchell, Aleksandr A. Svechin, Mikhail Tukhachevskiy, and Heinz Guderian sought new techniques (on land and in the air) and developed theories in an attempt to re-introduce maneuver to warfare as well as design a more effective way to gain decisive results.[36] Much of these new theories examined the linkages between a force's fighting front and its supporting rear. New communication and electronic technologies (e.g. wireless radios and radar) and increased staff planning responsibilities also made command and control headquarters more essential to successful and synchronized military operations. From this point on, military planning and operations were focused not only at an enemy's fighting front, equally important were key components that supplied resources (either with materiel of moral support) or provided command, control, or communication requirements necessary to ever increasing technologically based armed forces.

Modern operational theory—first explained by inter-war Soviet military theorist and later refined by the US Army in the 1970s and 1980s—combined with the theoretical perspective from the early air theorist resulted in an approach to planning and execution that resembled general systems theory.[37] Modern general systems theory, formulated by the Ludwig vonBertalanffy (1901-1972), began as a modeling devise to accommodate the interrelationships and overlap between separate disciplines (i.e. chemistry, physics, biology, as well as philosophy, economics,

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[35] Tom Czerwinski, *Coping with the Bounds: Speculations on Nonlineraity and Military Affairs*, [on-line]; available at http://www.dodccrp.org/copch2.htm; Internet; accessed 03 December 2002, Chapter 2, page 1. Because this work is accessible on-line by separate chapters only, subsequent references will be Czerwinski, chapter number, and page number. See also Greer, 1-2.

[36] A good summary of these theorists is in Bruce W. Menning's "Operational Art's Origins" *Military Review* (September-October 1997). A more detailed analysis is Christopher Bellamy's *The Evolution of Modern Land Warfare: Theory and Practice* (New York: Routledge Press, 1990).

[37] Ibid.

and business).[38] This holistic application of the definition of a system—a set of related components that work together in a particular environment to perform whatever functions are required to achieve the system's objective—is also applicable when considering an enemy nation or armed force as an open system that can be attacked and defeated through the planned and coordinated use of force. In his work *In Pursuit of Military Excellence,* Shimon Naveh explains this critical link of operational theory to system theory.

> in those campaigns where a systemic approach was applied, in both planning and management of armed forces, the nature of warfare was marked by sound operational logic. On the other hand, the longstanding failure to apply a systemic approach to the field of operational conduct throughout the nineteenth century and first quarter of the twentieth led to a suppression of a creative military thinking by a mechanistic mentality of attrition.[39]

US Air Force Colonel John A. Warden further articulated the linkage between operational theory and systems theory in his two seminal works: *The Air Campaign: Planning for Combat* (1988) and "The Enemy as a System" (1995). Warden explained that almost all states or political entities are composed of powers and used the mental model of five concentric rings to describe the relationship and composition of a political entity's power. At the center are leadership targets, then the means of production, infrastructure, population, and finally the fielded forces on the outer perimeter.[40] According to Warden, proper planning and targeting combined with a coordinated attack (simultaneous being preferred over sequential) would lead to the defeat of the component systems of the enemy, and ultimately defeat of the entire enemy system—operational victory through applied systems planning.

Systems theory, as it has been applied by past and current military planners, is really just the extension of linear reductionism; it is the scientific theory in military terms. Contemporary military planning is in essence a modern and reversed engineered version of Descartes "Great

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[38] One of the contemporary practitioners of systems theory is Peter M. Senge. In his book *The Fifth Discipline: The Art & Practice of the Learning Organization* (New York: Doubleday, 1990), Senge applies system theory to produce a series of guidelines for businesses and leaders to gain long-term competitive advantages in the corporate world.
[39] Naveh, xiii.
[40] John A. Warden, *"The Enemy as a System," Air Power Journal* (Spring 1995), 43-44.

Machine." Solving a military problem merely is completed by simply breaking it down into its component parts. The process is repeated until the problem is reduced to the smallest, indivisible part. The individual item or group of items are targeted and then attacked.

It is important to note that this form of planning and targeting is not a true manifestation of systems theory as explained by Bertalanffy and other "systems scientist." These men, striving to comprehend the increasingly complex nature of a variety of scientific disciplines and knowledge formulated theories that rationalized naturally occurring systems as wholes that maintained themselves in a changing environment by creative self-response and feedback.[41] Systems theory addresses both open systems (those that interact with their environment) and closed systems (those that are isolated from their environment). But current (incomplete) military systems planning and targeting process fail to acknowledge or treat systems as adaptive and integrated wholes, instead it views systems as mechanistic aggregates of parts linked in a causal relationship.

This incomplete form of systems-based planning and targeting is still the standard for modern military operations. The planning process for the defeat of the Iraqi forces in Kuwait in 1991 and the 1999 air campaign to compel Serbian President Slobodan Milosevic to withdraw from Kosovo are good examples of systems based planning and targeting.[42] But what if future enemies don't want to fight a US force that is becoming exponentially more lethal in high intensity conflict? Does the US Army possess a planning construct to feasibly apply to an enemy or situation that does not respond to systemic targeting or COG analysis?

Nonlinearity and Warfare

The transition from one form of warfare to another is never clean and discrete. Nevertheless, the factors that led to the rise of nation states, the industrial revolution, the atomic revolution, all influenced war and how it was fought during their respective periods. The

[41] Ervin Laszlo, *The Systems View of the World: A Holistic Vision for Our Time* (Cresskill, New Jersey: Hampton Press, Inc., 1996), 25-39.
[42] Michael Ignatieff, *Virtual War: Kosovo and Beyond* (New York, NY: Metropolitan Books, 2000), 57.

information technology (IT) revolution of the twenty-first century (really beginning in the 1990s with the mass usage of the Internet and satellite communications) is also one of these periods. This transition, wave, or generation is a dynamic confluence of related and unrelated factors that has and will continue to change not only how traditional military formations fight, but also how and why others (non-professional military formations) fight.[43] One of the primary results of the IT revolution is a more complex and inter-related world. How systems, whether they are a business or an army, handle the complexities of the twenty-first century will be the single most important factor in determining success or failure.

There are two general categories of complexity. *Detailed complexity* is present in a system when it has many variables. *Dynamic complexity* is present in a system where cause and effect are not obvious and are manifested in subtle ways.[44] Complexity also encompasses a theoretical concept that deals with the relatively new emerging science associated with non-linearity and study and complex adaptive systems.[45] Unlike the traditional (Newtonian based) sciences that seek to control and predict a systems behavior, complexity theory seeks understanding from an analysis of various, seemingly unrelated factors within a system that continue to act against each other. If the proper metaphor for linearity is the "Great Machine" of Descartes, or an intricate clock—composed of thousands of intricate parts that can be taken apart and re-assembled to produce the same precise functioning system, then the proper metaphor for non-linearity is the New York Stock Exchange—some days have similar patterns of gains and losses, but an infinitesimal number of variables make no two trading days the same.

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[43] "Waves" and "generations" of warfare are two of the more popular expressions used to describe the phases associated with societal development and the evolving nature of military affairs. Two significant works on this subject are Alvin and Hedi Toffler's *War and Anti-War: Survival at the Dawn of the 21st Century* (Boston: Little, Brown, and Company, 1993) and William S. Lind's "The Changing Face of War: Into the Fourth Generation," (*Marine Corps Gazette*, October 1989, pages 22-26).

[44] Senge, 71.

[45] The definitive work regarding complexity theory is M. Mitchell Waldrop's *Complexity: The Emerging Science at the Edge of Order and Chaos* (New York: Touchstone, 1992). Waldrop explains the fundamental and theoretical foundations of the theory. Additionally, Waldrop discusses the key researchers on complexity chronicles the events at the Santa Fe (New Mexico) Institute, the leading "think-tank" in the area of non-linearity and the study of complexity.

M. Mitchell Waldrop, a leading researcher in the study of complexity and the science of chaos refers to complex adaptive systems as the "engines" that drive non-linearity.[46] The primary goal of complex adaptive systems is survival. In order to survive, all complex adaptive systems operate in what complexity theorist term "the edge of chaos." Waldrop refers to the edge of chaos as "the constantly shifting battle zone between stagnation and anarchy, the one place where a complex system can be spontaneous, adaptive, and alive."[47] The most common description for this type of relationship within a system is the behavior of water molecules. Frozen (solid) water molecules—representing the region of *equilibrium*—are arranged in a tight lattice formation and stagnant. Conversely, vaporous (gas) water molecules—representing the region of chaos—are randomly configured because of its valence electrons are vibrating out of control due to the extreme energy (in the form of heat) applied to the system. The middle (liquid) state of water molecules—representing the region called complexity—is the life giving "oasis" region, where the complex adaptive system (water) thrives and is most productive.[48]

Complex adaptive systems are composed of seven basic attributes, consisting of four properties (aggregation, nonlinearity, flows, and diversity) and three mechanisms (tagging, internal models, and building blocks). *Aggregation* concerns the large-scale behavior of larger agents (meta-agents) from the collective interaction between other individual agents. *Nonlinearity* means that we do not get the value of the whole by adding up the value of all the parts; some other equation governs a nonlinear system. *Flows* represent a process where resources are transmitted from node to node through a connector. This relationship (node, connector, resource) exists in all complex adaptive systems. An example of this relationship in economic terms is bank (node), electronic fund transfer (connector), and money (resource). For a military organization, this relationship is also valid: command and control headquarters (node) radio or commuter network (connector), and information (resource). *Diversity* in complex

[46] Czerwinski, Chapter 1, page 3.
[47] Waldrop, 12.

adaptive systems is present in the multiple ways that agents can react with other agents, or other mechanisms within the system (tags, internal models, and building blocks), thereby allowing agents maximum feedback loops and ways to prosper. *Tagging* allows agents to form aggregates or groups. Agents use tags as mechanisms during adaptation to identify or non-associate with other agents. *Internal models* allow agents to anticipate the response of their environment. Evaluating the effectiveness and reorganizing patterns associated with these models is a key aspect of understanding the feedback (adaptive) process. *Building blocks* assist agents in the formation of useful internal models by providing information from previous experiences to confront evolving situations.

Although complexity theory does share a common theoretical basis (non-linearity) with chaos theory, and like general systems theory, a core principle of complexity does depend on the analysis of the behavior of a system, it is different from chaos and general systems theory for one reason. While chaos and systems theory have an implicit idea of feedback, complexity theory makes feedback mechanism explicit. The adaptive (feedback) behavior in complexity theory highlights the unique and interdependencies through any given system.[49] Understanding feedback, and the other specific characteristics of complex adaptive systems is central to comprehending how complexity theory can more effectively (than reductionism) describe how systems, as well as the agents within each system, relate to each other.

Two other critical concepts regarding feedback in complex adaptive systems are delay and pressure points. Delay within a complex adaptive system occurs as a result of the pause between an output and its regeneration (feedback) as an input by the system, which creates an entirely new output.[50] Pressure points are small changes in the control parameters of nonlinear systems that lead

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[48] This specific example is from Czerwinski, Chapter 3, page 2. A similar example is used by John Briggs and F. David Peat in their book *Turbulent Mirror: An Illustrated Guide to Chaos Theory and the Science of Wholeness* (New York: Harper & Row Publishers, 1989), 163.

[49] Michael R. Weeks, "Chaos, Complexity, and Conflict," *Air and Space Power Chronicles* (July 2001); [on-line]; available at http://www.airpower.maxwell.af.mil/airchronicle/cc/Weeks.html; Internet; accessed 18 October 2002.

[50] In terms of John R. Boyd's Observe – Orient – Decide – Act (OODA) loop, delay represents the time between decide and act. See John R. Boyd's "The Essence of Winning and Losing," (Unpublished briefing, April 1987).

to major qualitative transitions of behavior.[51] The identification of pressures points (either through human cognitive identification or artificial intelligence technology) is a critical requirement for any future planning construct.

The last concept regarding complex adaptive system that is relevant to this monograph is that of bifurcation. A bifurcation is the splitting into two modes of behavior of a system that previously displayed only one mode. It represents a transformation from one type of behavior into a qualitatively different type of behavior. The first bifurcation point is the edge of equilibrium—the boundary between linearity and nonlinearity. Following a second and a third split, a fourth bifurcation point (resulting in sixteen branches or decisions available to a system) marks the edge of chaos. The area between equilibrium and chaos is the complexity region—where complex adaptive systems survive and thrive.[52]

A complex adaptive system reacts to other complex adaptive systems in its environment, primarily using bifurcation and feedback, and then adapts to the environment or shapes the environment to its liking. The chosen path does not represent the optimal solution for survival, but merely a satisfactory one—one that is good enough to ensure survival by keeping the system within the bounds of equilibrium and chaos. When a complex adaptive system's behavior is viewed over time, the series of bifurcations combined with feedback cause the system to "shuttle" back and forth within the bounds of the complexity region. In *Coping with the Bounds: Speculations on Nonlinearity in Military Affairs*, Thomas J. Czerwinski's argues that future military organizations—operating as a complex adaptive system in competition with other complex adaptive systems—must not attempt to completely control (through linear reductionism) the complexity associated with future battle. According to Czerwinski, future military organizations should "cope within the bounds" of complexity while their enemy is driven into the stagnant region of equilibrium or the turbulence of chaos.[53]

[51] Briggs and Peat, 24.
[52] Czerwinski, Chapter 3, page 2.
[53] Ibid., Conclusion, 1.

The primary application of nonlinearity and complexity theory in military affairs is in the areas of command and control, intelligence gathering and interpretation, and planning. The separate services within the DOD have individually evaluated the tenants of complexity theory and its effect on warfare from a service-centric perspective. The US Marine Corps, like the US Army, is primarily concerned with the chaotic and non-linear applications of command and control and planning from mainly a ground perspective. The US Air Force focuses its research regarding complexity theory on its potential to more effectively and efficiently target a system and preventing it from adapting once it has been attacked.[54] Additionally, a considerable amount of interest in complexity theory and non-linearity was generated by the 2001 terrorist attacks on America and the on-going global war on terrorism. The students and faculty at the national and senior service war colleges as well as authors in military journals and defense think tanks are seriously considering how the emerging science and theories relating to complexity will change the nature of conflict.[55] Their collective research and writings argue for a greater influence of non-linear principles in the planning and execution of future military operations.

Complexity & Nonlinearity: Effects on Military Planning Doctrine

The concept of logical lines of operations is one way that current US Army doctrine addresses the complex nature of stability operations. FM 3-0 and the upcoming FM 3-07,

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[54] Andrew Ilachinski, *Land Warfare and Complexity, Part I: Mathematical Background; Part II: An Assessment of the Applicability of Nonlinear Dynamics and Complex Systems Theory to the Study of Land Warfare and Technical Sourcebook* (Alexandria, Virginia: Center for Naval Analysis, 1996). Also see Jeffrey R.Cares, John Q. Dickman, and Robert W. Freniere, "Complexity-Based Targeting," (Headquarters, Department of the Navy, Washington, DC: Chief of Naval Operations Strategic Studies Group XVIII Technical Report, 1999) for a detailed naval air-centric application of complexity theory.

[55] The most comprehensive repository of information regarding terrorism, asymmetric warfare, and complexity theory can be at: http://www.cna.org/isaac/terrorism_and_cas.htm. The banner on the web page is a clear statement of purpose: “The events on 11 Sep 2001 were a tragic, but decisive, reminder of the emergence of a formidable new kind of "enemy" in the world; an enemy that is widely dispersed, decentralized and whose many destructive parts are autonomous, mobile, and highly adaptive. The need for developing new complex systems theory inspired analytical tools and models for understanding the dynamics of this threat (and for providing insights into how to combat it) has never been greater. If ever there was a time for complexity theory to come into its own within the military operations research community (much as mathematical search theory did in WWII), that time is now!”

Stability and Support Operations, acknowledge the complexities that result from stability and support operations involving joint, combined, interagency, non-governmental organizations (NGOs), with the military units that conduct them under very strict rules of engagement (ROE).[56] According to current US Army doctrine, this difficult operating environment (political, military, and cultural situations that are highly fluid and dynamic) requires leaders and soldiers, at all levels, to be flexible and adaptive, possessing the mental and physical agility to shift from combat to non-combat missions because of the complexity involved.[57] Both of these doctrinal manuals explain complexity in terms of detailed complexity—the significant amount of groups (agents) from various perspectives within the myriad of complex adaptive systems that comprise any stability or support operation. However, FM 3-0 and FM 3-07 fail to properly explain dynamic complexity or acknowledge the non-linear relationships that must be identified and exploited during hyper-complex stability and support operations.

Non-linear operations are mentioned as part of the elements of operations design in FM 3-0, however it describes them in terms of maneuver and support units operations within noncontiguous areas throughout their assigned area of operations.[58] This planning design consideration, even though it shares the term "non-linear", is focused on an operation's spatial or geographical characteristics. Essentially FM 3-0's current interpretation of non-linear operations is merely an extension of lines of operations or lines of communication as first explained by Jomini. Non-linear operations, with non-contiguous unit boundaries, disconnected lines of operations, or severed lines of communication do increase detailed complexity for military operations, but they do not express or consider the qualities of non-linearity associated with dynamic complexity.

Arguably, current US Marine Corps doctrine is more effective than current US Army doctrine in articulating the fundamental concepts of dynamic complexity, complexity theory, and

[56] FM 3-07, *Stability and Support Operations (DRAG)* (Headquarters Department of the Army, Washington, DC: US Government Printing Office, 1 February 2002), 1-2.
[57] FM 3-0, 9-5.
[58] FM 3-0, 5-11.

the nonlinear principles that define current and future stability operations. The following excerpts from Marine Corps Doctrinal Publication (MCDP) 1, *Warfighting*, clearly explain the concepts of nonlinearity, leverage points, feedback loops, bifurcation points, the complexity "shuttle", and "coping within the bounds" of equilibrium and chaos:

> One important source of uncertainty is a property known as *nonlinearity*. Here the term does not refer to formations on the battlefield but describes systems in which causes and effects are disproportionate. Minor incidents or actions can have decisive effects. Outcomes of battles can hinge on the actions of a few individuals…[59]

> Like friction and uncertainty, fluidity is an inherent attribute of war. Each episode in war is the temporary result of a unique combination of circumstances, presenting a unique set of problems and requiring an original solution. Nevertheless, no episode can be viewed in isolation. Rather, each episode merges with those that precede and follow it—shaped by the former and shaping the conditions of the latter—creating a continuous, fluctuating flow of activity replete with fleeting opportunities and unforeseen events. Since war is a fluid phenomenon, its conduct requires flexibility of thought. Success depends in large part on the ability to adapt—to proactively shape changing events to our advantage as well as to react quickly to constantly changing conditions.[60]

> The occurrences of war will not unfold like clockwork. We cannot hope to impose precise, positive control over events. The best we can hope for is to impose a general framework of order on the disorder, to influence the general flow of action rather than to try to control each event.[61]

Despite MCDP 1's more accurate explanation of dynamic complexity and complexity theory when compared to the Army's FM 3-0 and FM 3-07, both of the services' capstone doctrinal publications merely address the subjects in a conceptual manner. They offer no specific planning construct or method for operational level planners and commanders to plan and execute hyper-complex stability and support operations. Planning doctrine must provide some type of common construct to be useful and not merely a set of esoteric characteristics that future

[59] Marine Corps Doctrinal Publication 1, *Warfighting* (Department of the Navy, Headquarters United States Marine Corps, Washington, DC: US Government Printing Office, 20 June 1997), 8.
[60] Ibid., 9.
[61] Ibid., 11.

operational level commanders and planners should possess in order to succeed in a more complex operating environment.

The principles of non-linearity and elements of complexity theory may be the specific rubric to gage or deal with HCOs. Arguably, the most applicable aspects of complexity theory that apply to military planning are leverage points, diversity, nonlinearity, building blocks and internal models. One construct—a direct refinement of complexity theory and non-linearity—that can possibly be incorporated into a future set of operational design considerations is Perrow's Quadrant's, developed by the sociologist Charles Perrow. Perrow devised a model for addressing the particular behavior of both linear and non-linear systems. His model, based on his investigation of the Three Mile Island nuclear plant accident, focuses on organizational causes of failure (either in the form of incidents (part or low level failure in a system) or in the form of accidents (failure of a critical sub-system or the system as a whole).[62] Perrow's model relies on two concepts to analyze potential failures in a system: interaction and coupling.

Conceptually, interaction aids in determining how prone certain systems are to accidents. In a linear system, interaction among the agents is highly structured, logical, repeatable, and characterized by minimal feedback.[63] Thus, failure in a linear system will produce an identifiable precise output that can be identified because of the conditions of the system. Non-linear or complex interactions are much less predictable. Failure of a sub-system or systems, each with multiple feedback mechanisms and bifurcation (decision points) can relate to each other in unforeseen ways during a myriad of situations, making prediction virtually impossible.

The second conceptual aspect of Perrow's Quadrant—coupling—is the amount of "buffer" between two items or agents in a system.[64] Loosely coupled systems do not follow a process that is rigidly sequenced and they possess very flexible control mechanisms. Conversely, in tightly coupled systems, rigidity dominates; delays or a slight change can have a significant effect on the overall system.

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[62] Czerwinski, Chapter 7, page 1.
[63] Ibid.

The two conceptual aspects of interaction (both linear an nonlinear) and coupling (both loose and tight) combine to describe a systems characteristics and propensity to fail do to an accident or incident. Perrow explains that a system or organization can have four types of tendencies: tight-linear, tight-complex, loose-linear, loose complex. This relationship is graphically illustrated in the Interaction / Coupling Chart. See Figure 3-1.

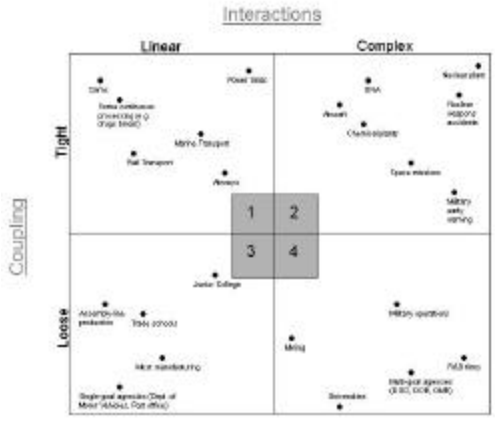

Figure 3-1 Interaction / Coupling Chart

Perrow explains each of the four quadrants and provides examples of organization that fit in each (e.g. a railroad company in quadrant 1, NASA is quadrant 2, a small-town gas station in quadrant 3, and university in quadrant 4).

The concepts contained in Perrow's quadrants are generally applicable to many types of systems and human organizations. Recently, two faculty members at the US Army War College have expanded Perrow's ideas into terms, phases, and concepts that more directly address the processes associated with military planning, operations, and command and control in the current hyper-complex operating environment. In "Janusian Thinking and Acting" (*Military Review* January-February 2002), Christopher R. Paparone and James A. Crupi argue for a new approach to military problem solving, one that would allow operational commanders and planners to "conceptualize a pattern of multidimensional possibilities that lead to breakthrough concepts and values because the traditional strategic linear way of thinking and acting is inadequate. Central to

[64] Ibid., 2.

the authors ideas is their explanation of the four type of conflicts that fit within the Janusian construct: type A conflict is low-intensity, high-uncertainty (LIHUC); type B conflict is high-intensity, high-uncertainty (HIHUC); type C conflict is high-intensity, low-uncertainty (HILUC); and type D conflict is low-intensity, low-uncertainty (LILUC).[65] See Figure 3-2.

Conflict Type	LIHUC (Type A)	HIHUC (Type B)	HILUC (Type C)	LILUC (Type D)
Analogy	Monroe Doctrine (1840s) New Frontier (1960s)	Asymmetric Warfare	World War II Desert Storm	Cold War (1950s)
Military Instruments	Coast Guard Special Forces	Naval Forces Semiautonomous SOF-Style Teams	Conventional Forces	"Missileer" Air Force "Boomer" Navy "Administratively Readied" Army
Planning Style	Commitment Planning Real-Time Response Discretion bounded by broad policy	Orientation Planning Discretion bounded by trust and a common appreciation	Contingency Planning Discretion bounded by law of war, geography, and policy end states	Standing Operating Procedure Discretion bounded by response plans and readiness standards
Method	Strategy and Tactics	Transcendental Value Systems	Operations, Tactics, and Strategy	Tactics (Tactics are Strategic)
Command & Control	Dispersed Guided by Strategy	Dispersed	Centralized and Delegated	Centralized Hierarchical
Federal Organizational Response	Federal Emergency Management Agency Embassy Country Teams	Homeland Security Office? Revised Unified Command Plan?	Warfighting CINCs	NORAD US Strategic Command

Figure 3-2 Comparison Chart for Janusian Conflict Types

Theoretically, these are four types of idealized conflicts, and planning considerations for each vary according the clear and discrete parameters of the conflict. In reality, these types of conflicts overlap and in some cases, all forms of conflict exist and are waged simultaneously. The Janusian framework allows commanders and planners to operate more effectively in multiple pattern environments, rather than embracing a singular one. Critical for operational planners is the realization that different planning styles and methods are required to effectively articulate a commander's vision into to a feasible, suitable, and acceptable plan.

[65] Christopher R Paparone and James A. Crupi, "Janusian Thing and Acting." *Military Review* (January-February 2002) 39. The term "Janusian" is derived from Janus, the Roman god of door or passage ways. Janus possessed two faces and was able to look both forward and backward, implying wisdom. BG (Retired) Wayne M. Hall also uses this concept in his paper "The Janus Paradox: The Army's Preparation for Conflicts of the 21st Century" (Association of the US Army Land Warfare Paper No. 36, October 2000).

Although Paparone and Crupi do not explicitly state that their Janusian paradigm is theoretically based on Perrow's quadants, it is clear that the interact-coupling relationship is present in the framework for their Comparison Chart for Janusian Conflict Types.[66]
In addition to considering tight / loose coupling, linearity /nonlinerity, the Janusian model also incorporates the concept of continuous tolerance for paradox, closely related to the concept of coping within the bounds of equilibrium and chaos. The concept of paradox—that individuals or groups can process contradictory information collectively in all quadrants simultaneously—represents a credible point of departure for modifying existing or developing new elements of operational design. A practical examination, in the form of a case study, is one way to evaluate if current planning doctrine falls short in providing planners and commanders with valid constructs when planning HCOs.

Conclusion

Humans have always attempted to control their environment. War and conflict is another example of this desire. Scientific method drove the development of military theory and doctrine, increasing in lethality, scope, and complexity in direct relation to the development of technology (Industrial Rev and IT Revolution), but still guided by linear methodology. Systems theory, with limited feedback mechanisms, has driven military planning, driven by the concept of detailed complexity, to a refinement of a linear-based process. One such aspect of this phenomenon is the planning construct of "lines of operations", which is primarily an increased fidelity of liner thinking and methodology.

New theories, based on the principle of dynamic complexity, have characteristics that directly relate to military planning and operations in the new century. The characteristics associated with nonlinearity and complexity, specifically, leverage points, and internal models like Perrow's Quadrants and Janusian thinking and acting, need to be applied to a new construct

[66] Ibid., 40-41.

and examined in within a hyper-complex scenario, because operational level commanders and planners operate at the “edge of chaos”.

CHAPTER 4

> The American Army can no longer run away from Vietnam. For it has found us in Afghanistan, the Philippines, and Colombia.
>
> Conrad C. Crane
> US Army War College, September 2002.[67]

Introduction

The primary purpose of this chapter is the examination of the doctrinal and theoretical concepts described earlier in the this monograph. Two different courses of action (COA) for a notional case study are subjects of evaluation and examination. One course of action is developed using the lines of operations planning construct and the other is developed applying principles of non-linearity and specific aspects of complexity theory as well as complex adaptive systems. The comparison of these two COAs and their associated planning constructs forms the basis of analysis towards answering the primary research question of the monograph.

Colombia: A History of Violence

Inevitably, when senior American policy makers, professional military personnel, or international relations pundits discuss the topic of Colombia, the dialogue will eventually lead to the failed US involvement in Vietnam. Vietnam—the conflict that ended almost thirty years ago—deeply affects the psyche of an entire generation of decision makers and their view of any future American involvement in a "civil war."[68] Nevertheless, as the above quotation states, the US must deal with the possibility of ground combat among a population at war with itself, in

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[67] Conrad C. Crane, *Avoiding Vietnam: The US Army's Response to Defeat in Southeast Asia* (Carlisle Barracks PA: Strategic Studies Institute, US Army War College, 2002), 19.

[68] For a detailed analysis of lessons learned from Vietnam that do and do not apply to the current situation within Colombia, see David Paggage's monograph titled, *The United States and Colombia: Untying the Gordian Knot* (Carlisle Barracks PA: Strategic Studies Institute, US Army War College, March 2000). Ambassador Passage served as the Director of Andean Affairs in the State Department (responsible for the overall US relations with Colombia, Venezuela, Ecuador, Peru, and Bolivia) for the Clinton Administration and as *Charge d'Affairs* at the American Embassy in El Salvador during the height (1984-1986) of that nation's civil war. He articulates his central point regarding this analogy on page 18 of his work; there are a number of valid lessons to be learned from Vietnam that can guide the US in formulating a coherent national plan regarding Colombia, but avoiding attempting to positively influence the developments in foreign countries of importance to the US should not be one of them.

failed or failing states, because of the potential for them to be used by terrorist groups with global reach.

The internal violence that Colombians deal with in the twenty-first century is not new. A unique history of political violence, minimal state government involvement or control of the peripheral and rural regions and a glorification of the *banditio* tradition have resulted in a culture of fatalism, a tolerance of organized corruption, and violence.[69] These factors initially led to a series of civil conflicts between Liberals and Conservatives, the bloodiest of these was the Thousand Day War (1899-1902), in which over 100,000 were killed.[70] Widespread violence occurred again between the two groups (1948-1966) when armed partisan groups loyal to the two parties extended the blood feud into the rural areas of Colombia. During this fifteen-year period, known as *La Violencia* (The Violence), over 200,000 Colombian were killed before the two parties agreed to an alternating power-sharing plan known as the National Front.[71]

During the later states of *La Violencia*, a disillusioned, largely rural, minority movement emerged to form "Peasant Republics" in the country-side not controlled by the elite and urban-based central government. Some of these various movements drew their organization and political structure around a socialist or communist model, and began to receive support from Moscow and Havana. This new political sphere in the Colombia political system not only concerned Colombia, it also drew the attention the US, deeply concerned about "another Cuba" occurring in the western hemisphere.[72] US military advisors recommended in 1962 the

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[69] Mark Bowden, *Killing Pablo* (New York: Atlantic Monthly Press, 2001), 7-14. Bowden summarizes in the first few pages of his book the geographic, cultural, and political, factors that have influenced the development and history of modern Colombia. They form the basis of his character development of the infamous drug cartel kingpin Pablo Escobar. According to Bowden, early (19th century) *bandito's* enjoyed a Robin hood-like position in Colombian society, outsiders to a central government dominated by two political parties.

[70] Ibid., 12. The Liberal and Conservative parties' initial fundamental disagreement concerned the role that Catholic priest should play in Colombian politics.

[71] Max G. Manwaring, *Nonstate Actors in Colombia: Threat and Response* (Carlisle Barracks, Pennsylvania: Strategic Studies Institute, US Army War College, 2002), 2.

[72] Ibid., 5. For a detailed study of the initial stages of US involvement in Colombia, specifically focused on the counter-insurgency faced by the Government of Colombia and the potential US role during the height of the Cold War, see Dennis M. Rempe's *The Past as Prologue? A History of U.S. Counterinsurgency Policy in Colombia, 1958-66* (Carlisle Barracks, Pennsylvania: Strategic Studies Institute, US Army War College, March 2002).

organization of "indigenous irregulars" as a fundamental component of the Colombian counterinsurgency strategy. These "paramilitary organizations" or more properly titled, "self-defense groups", were initially focused at defeating leftist guerrilla movements under a counter-insurgency plan in effect until the end of 1965 called *Plan Lazo*.[73]

The latent communist insurgency in Colombia in the 1960s and 1970s hardly drew US attention and was overshadowed by the full-scale American commitment to counter-insurgency in Vietnam. During this period, two groups—the FARC (*Fuerzas Armadas Revolucionarias de Colombia* [Revolutionary Armed Forces of Colombia]) and the ELN (*Ejercito de Liberacion Nacional* [National Liberation Army]) developed into the primary insurgent threat to the Government of Colombia. It was also during this period that these insurgent groups began their association with a new class of criminal in Latin America—narcotrafficers.[74]

Colombia's new drug cartels, first in Medellín and then in Cali, expanded from marijuana to the processing and export of cocaine. Led by a small number of powerful drug kingpins—the most infamous being Pablo Escobar—these family-based empires came to control a multi-billion-dollar cocaine industry that processed coca grown primarily in Bolivia and Peru, controlled virtually all aspects of Colombian life, and ruled by the principle of *plata* or *plamo*. They invested millions of dollars to purchase more than 2.5 million acres of land in Colombia between 1983 and 1985, amounting to more than one-twelfth of Colombia's productive farmland, and expanded their business to also include the cultivation of coca in Colombia.[75]

This period also saw the resurgence of illegal paramilitary forces called *autodefensas* (self defense groups).[76] These vigilante groups originally were formed to protect land (primarily cattle ranches and coffee plantations) and rural families from insurgent groups and "for-profit"

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[73] Rempe, 15-17.
[74] Angel Rabasca and Chalk, Peter, *Colombian Labyrinth: The Synergy of Drugs and Insurgency and Its Implications for Regional Stability* (Santa Monica, CA: RAND, 2001), 25.
[75] Bowden, 24-35. Translated from Spanish to English: *plata* is silver and *plamo* is lead. The situation that confronted most government officials, judges and law enforcement officers, or businessmen was to either accepted a drug cartel's silver (bribe) or received its lead (bullet).
[76] Angel Rabasca, and Peter Chalk, *Colombian Labyrinth: The Synergy of Drugs and Insurgency and Its Implications for Regional Stability* (Santa Monica, CA: RAND, 2001), 53.

kidnappers, but with funding from drug traffickers and other large landholders, and close (and often open) collaboration with Colombia's Armed Forces, the paramilitaries gained strength throughout the 1980s. Their tactics—selective assassinations of anyone alleged to be a FARC rebel or leftist sympathizer, massacres, forced displacement of entire populations—quickly made them one of the country's main human rights abusers.[77] Fueled in large part by drug money, the paramilitaries banded together in the early 1990s to form a loose confederation known as the AUC *(Autodefensas Unidas de Colombia* [United Self-Defense Groups of Colombia]) with more than 8,000 members. The AUC, along with the FARC, ELN, and the military forces of state government are locked in a struggle for the very future of Colombia.

Many Americans may ask: "Why does Colombia matter?" Purely considering economic and financial factors, Colombia is extremely important to the US. Colombia is the eight largest supplier of oil to the US. Additionally, Ambassador David Passage, the former US State Department Director of Andean Affairs, argues that Colombia is far more important economically to the US than the Balkans; the US does more business and trade with Colombia in a week than it does in a year with all of the Balkan countries combined. In 2000, Colombia became the third largest (behind Israel and Egypt) recipient of American aid money.[78]

The drug trade—and its costs in terms of US government fiscal expenditure to combat it, the amount of violent crime it spawns, and the thousands of ruined lives it has caused—is by far the most significant reason why Colombia should matter to Americans. Ninety percent of all the cocaine illegally purchased by Americans is grown and shipped from Colombia, costing US society 52, 000 lives and $110 billion a year.[79] The scourge of the drug trade has also torn apart Colombian society. Over 3,500 kidnappings (of the 7,000 reported world-wide) occurred in Colombia in 2001. In the last decade, 300,000 murders took place (with only four percent

[77] Julia E. Sweig, "What Kind of War for Colombia?" *Foreign Affairs* (September/October 2002), [on-line]; available at http://www.foreignaffairs.org/Search/printable_fulltext.asp?i=20020901FAEssay9737.xml; Internet; accessed 4 September 2002, 3.
[78] Passage, 6.

resulting in conviction), including four presidential candidates, 200 judges, 1,200 police officers, and 150 journalists.[80]

By the late 1990s, this violent laden environment (fueled by drug revenue, kidnapping, and two generations of insurgency) drove some Colombian politicians to consider a different approach to solve Colombia's problems; one of these was Andres Pastrana. Elected on a "peace ticket" in 1998, Pastrana made peace talks with guerrilla groups his highest priority, and sought to accompany negotiated reforms with what he called a 'Marshall Plan' of development for Colombia's countryside.[81] In September of 1999 Pastrana appealed to the Clinton Administration for support of *Plan Colombia*, a Colombian initiative "for peace, prosperity, and the strengthening of the state" that would cost $7.5 billion, $4 billion from Colombian funds and $3.5 billion from the international community.[82] *Plan Colombia* addressed five basic issues that plagued the South American nation: the peace process with leftist insurgents; the Colombian economy; narcotrafficing and the counter-drug strategy; reform of the Colombian justice systems and the protection of human rights, and the plan for democratization and social development.[83]

In 2000, the US Congress approved a supplemental funding package that included $ 1.63 billion for American support of Plan Colombia with two key provisos. First, US support (in the form of military assistance and training) can only directed toward counter-drug operations; support to Colombia's counter-insurgency was strictly prohibited. Second, the so called "Leahy

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[79] Bureau of Western Hemisphere Affairs, "Why Americans Should Care About Plan Colombia," U.S. Department of State (Washington, DC, 21 February 2001) [on-line]; available from http://www.state.gov/p/wha/rls/fs/2001/1040.htm; Internet; accessed 17 August 2002.

[80] Rafael Pardo, "Colombia's Two-Front War," *Foreign Affairs* (July/August 2000), 33. One of the more prominent figures that has been kidnapped is Ingrid Betancourt, a senator and a presidential candidate in Colombia, and the daughter of a prominent Colombian diplomat. Betancourt was extremely critical of the leftist rebel groups and the paramilitaries as well as the Government of Colombia in her book titled *Until Death Do Us Part: My Struggle to Reclaim Colombia* (New York: HarperCollins Publishers, Inc, 2002).

[81] Sweig 4.

[82] The phase "A plan for peace, prosperity, and the strengthening of the state" comes from the sub-tile to the original version Plan Colombia, published in 1999. The entire text of Plan Colombia can be found on-line at: *Plan Colombia*, Unites States Institute for Peace Site [on-line]; available from http://usip.org.library/pa/colmbia/addoc/plan_colombia_101999.html; Internet; accessed 4 January 2003. For a detailed scholarly study of Plan Colombia and its relevance to US military policy in Colombia see: Richard J. Koucheravy, "The United States and Plan Colombia: A Direct Combat Role?" (Fort Leavenworth: School of Advanced Military Studies, 2000).

[83] *Plan Colombia*, 1.

Amendment" restricted any US support to Colombian military or police units that were guilty of any human rights abuses.[84] Additional constraints came in the form of personal caps for both uniformed and civilians under US government contract; a total of only 400 members of the US Armed Forces (primarily Special Forces and signal intelligence specialist) and 400 civilian contractors (primarily helicopter pilots, crew chiefs, and support personnel) could be in Colombia in support of the US effort.[85]

Later in 2000, Pastrana—in a bold but controversial attempt to cease the civil violence—granted the FARC autonomous control of a demilitarized area within Colombia (about the size of Switzerland) known as the *zona de despeje*, as well as outlawing the AUC.[86] Instead of honoring its commitments, the FARC used the *despeje* as a base to move drugs and arms, a sanctuary to rest and refit its forces as well as a launch point for larger terrorist strikes against the Colombian government, and even a location to hold prisoners or hostages. By mid-2001, many senior members of the George W. Bush national security team began to consider the possibility of a partial or total collapse of the Colombian state and a 11 September 2001 visit to Bogotá by Secretary of State Colin Powell was planned to begin the formal dialogue of a greater than counter-drug role for the US in Colombia.[87]

After September 11th terror attacks, some senior US government officials began to consider the threat of terror groups with global reach potentially using the *despeje* and other FARC and ELN controlled portions of Colombia as a safe heaven from which to attack the US. By early 2002, the FARC, ELN, and AUC were all on the US State Department's twenty-nine-member list of Foreign Terrorist Organizations, and there is growing evidence of a presence in Colombia of terror groups linked to Iran, Venezuela, Iraq, and the Irish Republican Army (IRA).[88] In his opening remarks to the House International Relations Committee, Chairman

[84] Koucheravy, 25.
[85] Sweig 8.
[86] Ibid., 4.
[87] Adam Isacson, "Colombia's Human Security Crisis," *Disarmament Forum - Human Security in Latin America* (Geneva: The United Nations Institute for Disarmament Research, 2002 no. 2), 25 – 40.
[88] "In the Spotlight: Revolutionary Armed Forces of Colombia (FARC)," *CDI Terrorism Project* 7 May 2002 [on-line]; available at http://cdi.org/terrorism/farc-pr.cfm; Internet; accessed 18 August 2002, 2-3.

Henry Hyde (speaking about US policy towards Colombia) drew clear links to the growing problem:

> We must not be blinded by false ideological labels. There is no left and no right in Colombia, only competing bands of narco-terrorist criminals. Three hours by plane from Miami, we face a potential breeding ground for international terror that could one-day rival Afghanistan. Hizballah and other international terrorists have put down deep roots in the Western Hemisphere. It is folly to think that they would not be attracted to a nation beset by violence, drug trafficking and corruption.[89]

In late 2002, continued pressure to strike-down the artificially imposed firewall between counter-drug and counter-insurgency operations within US policy towards Colombia came from other portions of the government. Senior uniformed officials, diplomats, and drug policy leaders argued that the nexus of drugs, insurgency, and terror in Colombia required a more holistic strategy that must focus on more than merely stemming the flow of drugs. The significance of oil and the security of its distribution also is an important factor in US-Colombian relations. The US Congress appropriated $98 million to help the Colombians protect a 480-mile long oil pipeline, 44 percent owned by the Los Angeles-based Occidental Petroleum. US Special Forces now train Colombians to protect the Caño Limón-Coveñas oil pipeline, which Colombian guerrillas dynamited 166 times in 2001.[90] In conjunction with the pipe-line protection funding, House Resolution (H.R.) 4775 also changed US law to allow for all (past, present, and future) financial and military aid to Colombia to be used to support a "unified campaign againstnarcotrafficing, terrorist activities, and other relevant threats to [Colombian] national sovereignty."[91]

In 2002 the Government of Colombia, realizing that the *despeje* provided the FARC too many military advantages (e.g. protected training and logistics base, central position and interior lines of communication) re-occupied the zone. Additionally, the Colombian citizens overwhelming elected the conservative Alvaro Uribe in August of 2002 with a mandate to launch

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[89] Statement of Rep. Henry Hyde (R-Illinois), April 11, 2002: Hearing of the Western Hemisphere Subcommittee, House International Relations Committee on "U.S. PolicyToward Colombia". *The Center of International Policy: The Colombia Project* [on-line]; available from http://www.ciponline.org/colombia/02041102.htm; Internet; accessed 29 December 2002.
[90] Isacson, 37.

large-scale offensive operations against the leftist, while neutralizing the AUC. In the most recent *National Security Strategy of the United States of America*, President George W. Bush clearly explains that he strongly desires to assist President Uribe in his efforts. It reads: "We [US] are working to help Colombia defend its democratic institutions and defeat illegal armed groups of both the left and right by extending effective sovereignty over the entire national territory and provide basic security to the Colombian people.[92]

Modern Colombia: A Complex Adaptive System

Numerous metaphors—a Hobbesian Trinity, a Gordian Knot, and a labyrinth to name a few—have been used in an attempt to explain the combination of complex problems that face modern Colombia. Regardless of what metaphor one uses to explain the situation, it is clear that Colombia has been suffering from an ongoing conflict that has cost hundreds of thousands of lives and continues to threaten the sovereignty and national security of the state. Any attempt to define or explain this pervasive conflict in singular terms such as a "drug war", a "Colombian Civil War", or a "war on terrorism" is not accurate. Colombia has been and will continue to be a unique combination of societal factors with all the properties of a complex adaptive system.

Multiple diverse agents are aggregated within the Colombian complex adaptive system define the central systems' very character. This *aggregation* of the Colombian government is clear to see. The COLAR has specific counter-drug battalions, counter-guerilla battalions, "riverine" battalions. The *Policia Nacional* (National Police) is organized to precincts and the Colombian Air Force into wings. The FARC is also aggregated into seven "blocs" that are further aggregated into "fronts" and still further aggregated into "columns" of roughly 100 hundred FARC soldiers.[93] The 8,000 active combatants that compose the AUC are aggregated into small (20 – 40) man groups that can unite to form "shock brigades" of up to 250 combatants. Each of these military units is *tagged* with specific uniforms or insignia that differentiate them

[91] Ibid.
[92] The White House, *The National Security Strategy of the United States of America.* (September 2002), 10.

from the other agents. Additionally, the logos of international businesses like Occidental, Dole, and others present in Colombia, underscore the relationship and identity of each agent within the system.[94] *Flows* exists and are manifested in many ways in the Colombian complex adaptive system, the most prevalent is in the movement of the illegal trade of weapons, capital, and drugs. Narcotraffickers use he river system within the country to flow large quantities of kerosene, sulfuric acid, potassium, acetone, and other chemicals required to produce cocaine. The ELN and FARC disrupt the flow of oil by blowing up portions of the Caño Limón-Coveñas oil pipeline in the northeastern province. In addition to various state, insurgent, and paramilitary groups, other agents like private military contractors, non-regional terror or criminal groups, as well as international non-governmental organizations (NGOs) and private-volunteer organizations (PVOs) increase the *diversity* within the Colombia complex adaptive system. All these agents individual apply *internal models* and *building blocks* (e.g. the COLAR continues to improve its tactics [battalion sized raids versus platoon sized defensive outpost], its equipment [increased use of UH-60 Blackhawk helicopters], and its organization [created three counter-narcotic battalions]) to maximize positive feedback and insure survival of the sub-system.

The US is already diplomatically, economically, and militarily engaged in Colombia. An increased involvement in all three areas may result in the future if the FARC further erodes Colombian state sovereignty, the illegal drug trade destabilizes Colombia or another regional nation, or a significant attack from an international terror groupis launched against the US from Colombia. A large-scale stability operation in Colombia would involve a myriad of military missions (counter-terrorism, counter drug, foreign internal defense, raids, and attacks), extensive interagency coordination (State Department, CIA, FBI, DEA, USAID), and regional multinational support (Organization of American States, Brazil, Venezuela, Peru)—the very definition of a hyper-complex operation. Because of the complexities that would be

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[93] Rabasca, and Chalk, 27.
[94] Julia Olmstead, "In Colombia, US Companies Get Down to Business" [on-line]; available from http://www.americas.org/News/Features/200206_Companies_Colombia/20020601compan.html; Internet; accessed 4 January 2003.

involved in a US led stability operation in Colombia, it provides a suitable scenario to analyze the key components of the research question of this monograph.

Notional Case Study Scenario: Operation MONROE ACTION

Colombia in 2008 is a failing state, terminally weakened by the influx of illegal foreign capital (primarily from the illegal drug trade) to insurgent groups and the exponential increase of international criminal syndicates and terrorist organizations. The Government of Colombia controls approximately fifty percent of the major population centers and barely twenty percent of the rural countryside. Judicial and legal institutions have been replaced by martial law in some regions or by out-right anarchy in others. Private protections firms—a kind term for an unregulated band of opportunist that kill and murder in the name of protection—guard the wealthy elite while the Colombian Armed Forces struggle to fight the leftist guerillas in large-scale military operations on the streets of Bogotá, Cali, and Medellín. The FARC, able to unite all minor leftist groups in the country under its control, fields a 40,000 man fighting force and is augmented with conventional and asymmetric warfare trainers from various rouge states and terrorist groups.

Many in the west argue for US involvement, with some wanting to apply the "Afghan model" of intervention while others want a larger commitment of US forces to ensure Colombian state survival.[95] Other nations in the region, suffering from a latent leftist movement within their own borders, support US involvement to solve this hemisphere problem. The Free Trade Area of the Americas (FTAA), scheduled to be in effect in 2005, has not occurred and the entire Central and South American region is in a economic tail-spin; most economist blame the political

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[95] In late 2001 and 2002, a small contingent of US ground forces, primarily special operations forces and conventional light infantry, combined with indigenous resistance fighters and US air power to overthrow the oppressive Taliban regime in Afghanistan. For a good summery of this view of the Afghan model, see: *Keys to Battlefield Success Unchanged?Afghanistan and the Future of Warfare: Implications for the Army and Defense Policy* by Dr. Stephen Biddle (Carlisle Barracks, PA: Strategic Studies Institute, US Army War College, November 2002).

instability in Colombia for the FTAA's failure to meet its initiation timeline.[96] Invoking the 1947 Inter-American Reciprocal Defense Treaty (also known as the Rio Treaty), twenty-two member nations (twenty-one of the charter members plus Canada) of the Organization of American States (OAS) call for the creation of a multi-national military force and mission in Colombia to work with the Government of Colombia and the defeat the FARC. Canada and Argentina, two nations with considerable peace operations experience, agree to send troops to Colombia, but only in a peacekeeping capacity. Venezuela, Ecuador, and Peru agree to logistical support and host-nation facilities in order to thwart FARC usage of the boarder regions in these two nations. Combat forces from Brazil and the US will conduct the initial stability operations of foreign internal defense (FID), counter-insurgency operations (COIN), and counter-drug operations.

United States Southern Command (USSOUTHCOM) has activated a Combined Joint Task Force (CJTF-Colombia) to command and control the stability and support operations in Colombia. The hemispheric effort to preserve the Colombian state, and save it from the fate of Afghanistan and Somalia, is named Operation MONROE ACTION. CJTF-Colombia is responsible for the stability operations during phase 1(Re-establishment of the state control over all of Colombia). A Combined Joint Interagency Group (CJIAG-Colombia) will assume responsibility of operations during phase 2 (Re-building state institutions). An OAS monitoring team will assume oversight of operations during Phase 3 (On-going stabilization of government institutions).

Summary of Course of Action 1: Logical Lines of Operations

The detailed complexity associated with the sheer number of participants in CJTF Colombia dominated the initial planning process long before any troops engaged in operations. The CJTF-C staff used some elements of joint campaign planning, but since the nucleus of the CJTF-C staff is an Army corps, the primary planning construct used by the CJTF-C planners is FM 3-0's elements of operational design. The planners identified FARC southern bloc

[96] Joseph R Nunez, *Fighting the Hobbesian Trinity in Colombia: A New Strategy for Peace*(Carlisle

(composed of twenty-one fronts) as the operational center of gravity, the destruction of which would support the overall military conditions required to achieve the operational end-state. The defeat of the southern FARC fronts became the counter-insurgency focus of CJTF-C. The campaign's military "push to the south" in order to defeat the FARC fronts was accompanied by counter drug operations (expanded aerial herbicide fumigation, strikes on coca labs, and interdiction of ground and river distribution of key chemicals in cocaine production process) in the southern provinces of Caquetá and Putumayo. Counter-terrorism operations and reinforcing information operations were focused on the key population centers of Bogotá, Cali, and Medellín.

The CJTF assigned tasks to different units and agencies with certain expertise, these tasked overlapped and a second and third order effects analysis was conducted, but the individual tasks were tracked linearly in three phases along four logical lines of operations model. See Figure 4-1. Decisive points along these lines of operations lead to the definable and (perceivably) achievable identified end state.

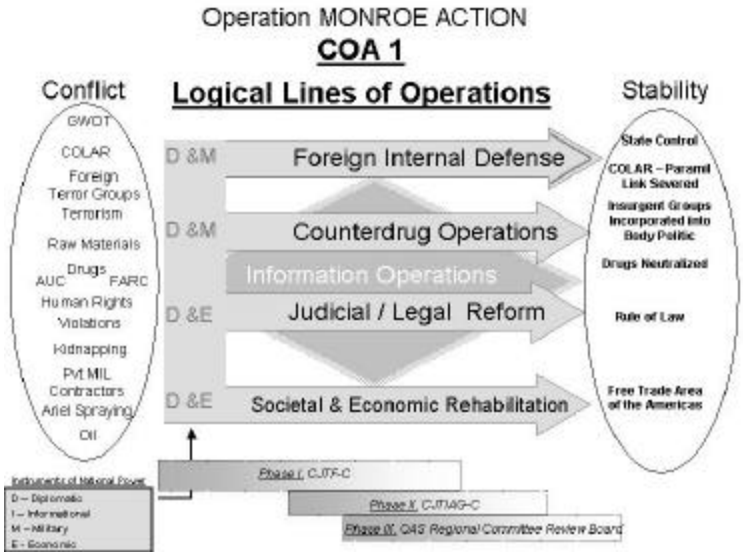

Figure 4-1 Logical Lines of Operations

Success or failure in achieving these decisive points determines the relative evaluation of how future operations will be conducted. Limited feedback occurs in the form of re-tasking or

Barracks, Pennsylvania: Strategic Studies Institute, US Army War College, 2001), 27.

prioritization of resources (personnel, materiel, and information operations) and the execution of branches or sequel to the original campaign plan.

Summary of Course of Action 2: Complex Matrix of Operations

The extreme amount of detailed complexity present in the overall Colombian stability operation also influenced the development of the second planning course of action. Additionally, an initial assumption for planning included the presence of dynamic complexity, where an unforeseen relationship among the multiple agents within Colombia would fundamentally changed the way the stability operations need to be conducted. This assumption allowed for an iterative feedback process, resulting in the replacing of decisive points for a series of measures of effectiveness. The replacing of binary decisive points (i.e. the objective was either achieved or not) with measures of effectiveness (i.e. an assessment of the systems relative position between equilibrium and chaos) also fundamentally changed the construct for planning and evaluation. The CJTC-C planning staff used the considerations for stability operations and modified them for Operation MONROE ACTION.[97] The measure of effectiveness were:

- Leverage interagency, joint, and multinational cooperation
- Enhance the capabilities and legitimacy Colombia
- Understand the potential for unintended consequences of individual and small unit actions
- Display the capability to use force in a nonthreatening manner
- Act decisively to prevent escalation
- Apply for selectively and discriminately

A planning matrix of operations determines initial tasks by unit capability, but feedback within the complex adaptive system of Colombia drives operations. Each sub-system or agent is assigned a task or multiple tasks and, for planning purposes, viewed against the agent-task complexity quadrant. Military focused agents are assigned tasked based on the four quadrants of conflict (LIHUC, HILUC, LIHUC, HIHUC), while Diplomatic, Informational, and Economic agents are focused and assigned tasked based on an interaction–coupling model (Tight-Complex, Tight-Linear, Loose-Complex, Loose-L). See Figure 4-2.

[97] FM 3-0, 9-14.

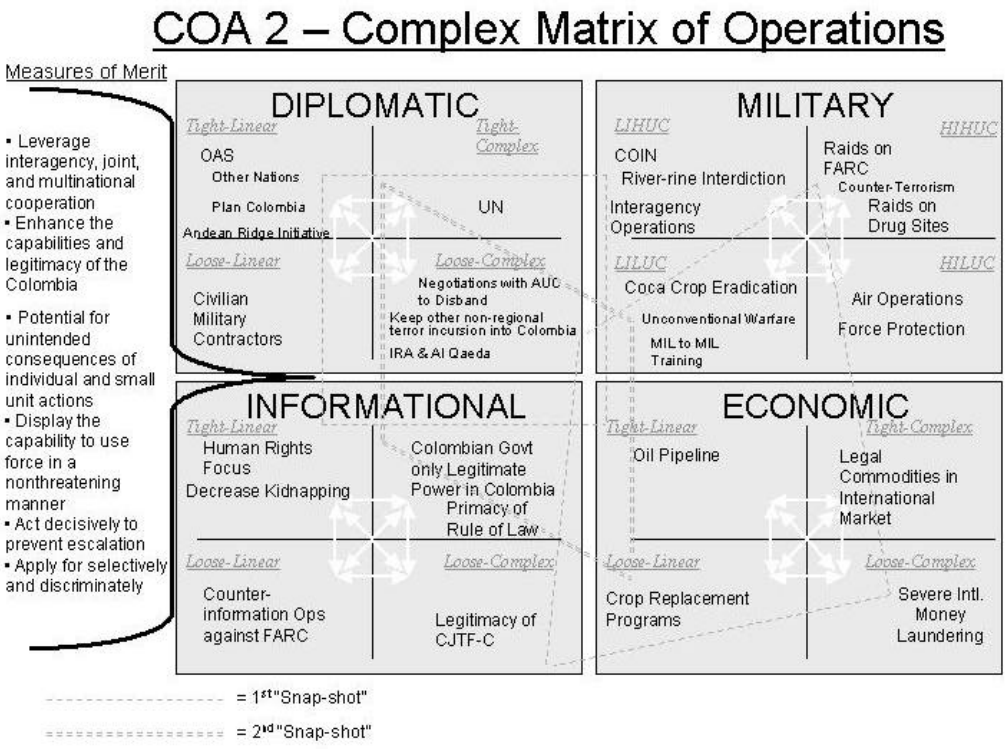

Figure 4-2 Complex Matrix of Operations

The initial matrix requires just as much analysis and war gaming as the lines of operations construct, however, operations are evaluated against the measure of effectiveness and their relationship to other factors within the system at that particular time. This "snapshot" analysis—a direct result of the application of Operational Net Assessment (ONA) tools fielded down the CJTF level— is also evaluated (by both human, artificial intelligence, and agent-based simulations of complex adaptive systems) for non-linear relationships among the actors in the system.[98] Each subsequent "snap shot" determines different and unique relationships within the systems. As each snap shot occurs, internal models serve as building blocks for future operations

[98] As part of the on-going DOD Transformation process, US Joint Forces Command (USJFCOM) is currently working to produce "Knowledge Centric" organizations and through the fielding of Operational Net Assessment (ONA) tools. According to USJFCOM, ONA tools will "provide information collection, storage, processing, sharing, and display functions necessary for leaders to assess a threat and work to either dissuade a potential enemy, or defeat an adversaries." See USJFCOMweb-site [On-line]; available

for agents in the system. The feedback process of "system snapshots" facilitates an adjustment of effort and resources. Operational branches and sequels to the original plan provide variance or shuttling process within the various sub-systems, keeping the positive sub-systems in the complexity region and the forcing negative sub-systems to an eventual equilibrium (by limiting their bifurcation or decision points) or beyond the "edge of chaos" (by overwhelming their ability to adapt).

Comparison, Analysis, and Conclusions

Criteria for evaluation of multiple courses of actions address factors that can affect success as well as those that can cause failure of a plan or operation. The determination of effective evaluation criteria for notional complex stability operations in Colombia is a factor of not only the positive and negative aspects of the planning construct applied at its start state, it also must consider how the planning construct applied in each COA would develop in execution. This dual evaluation of a planning construct (planning and execution suitability) as articulated in the first chapter of this monograph, is a major component of hyper-complex operations. In an essay titled "Thinking and Planning: Vision 2010" (Association of US Army Land Power Essay No. 98-6, 1998), US Army Brigadier General Wayne M. Hall, defines the characteristics that must be essential to a "holistic approach to planning" to complex operations in twenty-first century.[99]

- **Coherence:** Harmony among interacting parts of a plan. A holistic planner, through the manipulation of variable (both tangible and intangible) extends his commander's vision from the present to the future.
- **Combination:** The grouping of things (both similar and dissimilar)
- **Continuity:** The linkage of actions now to actions in the future.

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from http://www.jfcom.mil/about/experiments/mc02/concepts/onatools.htm; Internet; accessed 20 February 2003.

[99] Wayne M. Hall, "Thinking and Planning: Vision 2010" (Association of the US Army Land Power Essay Series No. 98-06, September 1998), 7-9.

Although the two COA have unique theoretical bases—making their elements, basis of assessment, and relationship different—the essentials to planning explained by Hall serve as effective criteria to analyze the suitability of future operational plans and are used for analysis of the two COAs developed in this case study.

Both approaches used in the COA development possessed positive aspects that related to combination and continuity. Lines of operations and a matrix of operations, effectively consider more than just military operations to support a commander's vision for the future and arrive at a desired endstate. However, the primary criterion that demonstrated a significant difference between the two planning constructs (COAs) was coherence. Lines of operations cannot effectively identify and manipulate the intangible (nonlinear) variables that will allow a plan to extend to success in the future. Because the complex matrix of operations construct (COA2) was aided by an ONA-type process and technologies, it is able to identify the nonlinear leverage points that would, after multiple iterations of feedback and adjustment to the overall system scheme, produce the desired goal of operating in a state of complexity, gauged by identified measures of merit.

An example of this is the linkage of aerial herbicide fumigation to a credible alternative development effort in the southern province of Putumayo in COA2 when using the complex matrix of operations. Since the spraying was not accompanied by a credible alternative development effort in COA1, thousands of peasants who had their crops eradicated suddenly found themselves with no way to make a living. This linkage was accounted for in separate lines of operations (counter drug and social economic rehabilitation), however, the lack of accurate and timely feedback mechanisms resulted in two unforeseen and results: a humanitarian disaster because of great numbers of people were leaving Putumayo, some across the border into Ecuador and others to plant coca elsewhere in the country. Additionally, young people, lacking other economic opportunities, volunteered to join the FARC fronts in renewed offensive against government and CJTF-C forces.

Figure 4-1 summarizes the general points of the COA comparison, the two different planning constructs, and their associated execution / feedback qualities.

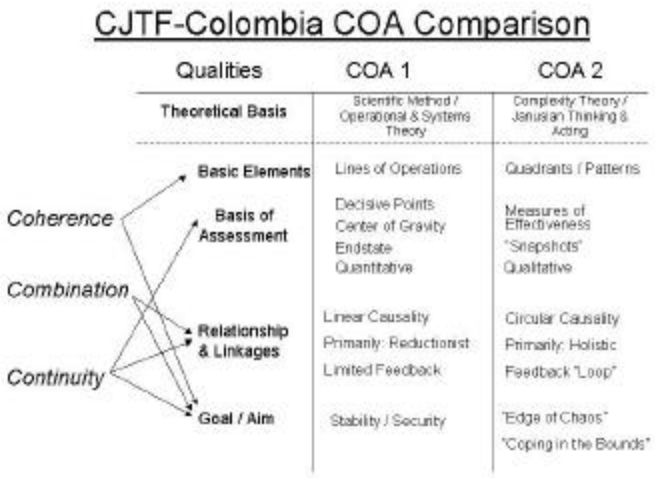

Figure 4-3 Case Study COA Comparison

Conclusion

The comparison of two operational courses of action, each based on two distinct theoretical backgrounds, within a notional future scenario may not initially appear to be the most effective way to test the utility of a planning construct. This techniques does have its shortcomings, however, it is common in the field of military related operations research and testing. Despite the shortcomings of using this technique, when applied to this monograph and used in the course of action analysis and comparison, did yield some useful information regarding the utility of lines of operations in stability operations.

The COA that utilized lines of operations did apply military and non-military resources (in cause and effect relationships) to plan for the attainment of stability in Colombia. However, the construct's limited feedback, combined with the focus on the identification of quantitative based decisive points makes it inflexible once operations commence. The COA that utilized a matrix

of operations served not only to more effectively depict the holistic nature of the complex stability operations, it also allowed for increased fidelity on how the agents relationships changed, providing qualitative feedback as the operation evolved within the whole Colombian complex adaptive system.

There is a difference between second / third order effects and ripples that move through a system displayed because of non-linear relationships As the complexity of stability operations increases, logical lines of operations may have various lines through multiple environments (land, sea, air, space, etc…) exponentially increasing the number of interactions and associated effects. In its present form, the construct of lines of operations cannot deceases in utility as the level of complexity (both detailed and dynamic) increases. See Figure 4-4. Any new planning construct must rectify the difference and account for the existence, if not prediction of, these interactions and their potential nonlinear relationships.

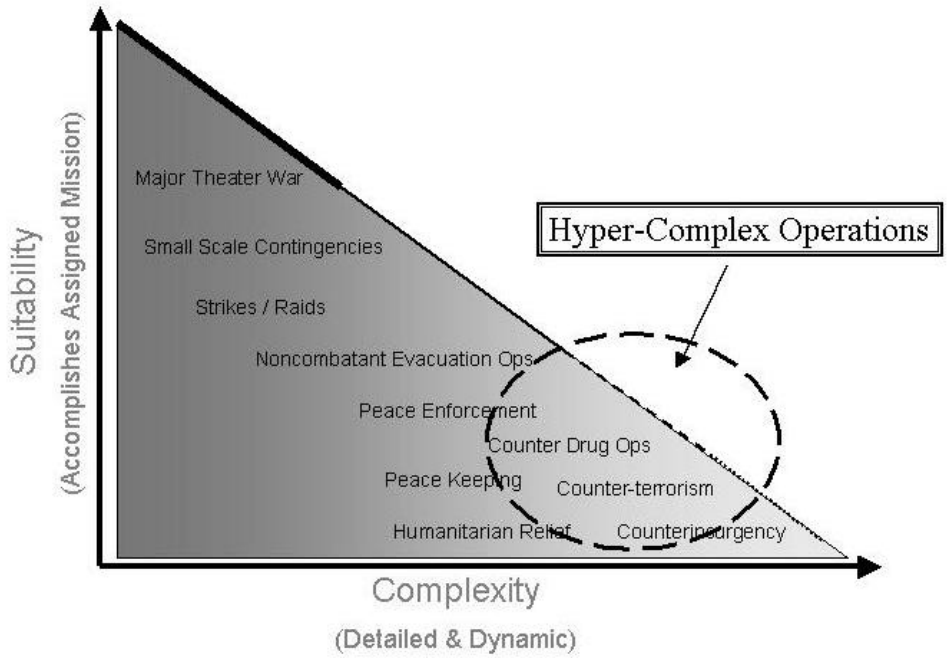

Figure 4-4 Utility of Logical Lines of Operations for Operational Planning

CHAPTER 5

> So a military force has no constant formation, water has no constant shape: the ability to gain victory by changing and adapting according to the opponent is called genius.
>
> Sun Tzu, *The Art of War*[100]

Analysis and change are fundamental themes of this final chapter. Consistent with these themes, two subjects form the basis of evaluation and discussion. First, a summary of the conclusions identified at the end of chapters 2-4 provides a foundation for final analysis. Included in this final analysis is a discussion of themes present throughout the entire monograph. Second, recommendations address specific ways to improve operational level planning constructs and ways to improve current US Army SASO doctrine. Although refinement of doctrine is the focus of this portion of the chapter, recommendations for training and educationare also addressed.

Summary of Conclusions

1. The term “lines of operations" is an important part of the military lexicon and has utility in the tactical or operational orientation of a force (geographic), as well as a construct for operational level planning (logical).

2. Lines of operations as a planning construct, as with all current operational theory and planning, is an extension of the scientific method (linear reductionism) and an application of some principles of systems theory.

3. Nonlinear principles, certain aspects of complexity theory, and other emerging paradigms offer the some credible alternatives to current planning constructs like logical lines of operations.

4. Current Army doctrine (FM 3-0 and FM 3-7) acknowledges that detailed complexity increases in hyper-complex operations, however they fail (either conceptually or through the lack of a planning construct) to acknowledge the role that dynamic complexity will play.

[100] Sun Tzu, *The Art of War,* Translated by Thomas Cleary (Boston, MA: Shambhala, 1991), 49.

5. Current Army SASO doctrine (FM 3-0 and FM 3-7) relating to operations involving combat is too benign. They reflect the strategic guidance contained in the 2000 version of the *National Security Strategy* and do not reflect the current (2002) *National Security Strategy's* offensive orientation or policy of preemption.

6. Logical lines of operations is a suitable construct for the planning of stability and operations that do not involve combat operations. Its effectiveness decreases as the detailed complexities associated with non-combat stability and support operations combine with the dynamic complexities inherent in combat operations.

7. A lack of a planning construct that applies the principle of nonlinearity and dynamic complexity, combined with the limitations of current technology to field artificially intelligent tools that can leverage nonlinearity, limits the use of emerging theories in planning.

8. As identified in the case study, improved planning constructs during future HCOs are predicated upon improved technology and the development of agent-based simulations of complex adaptive systems and planning tools that can extract and understand any subtle and/or otherwise "hidden" patterns of behavior during war or SASO. The purpose of the case study was to support the primary research question by providing HCO scenario (problem statement) for the analysis of two general COAs developed with two different planning constructs; the notional scenario accomplish this purpose. Additionally, an evaluation and assessment of Colombia's near-term future and a summary of some of the challenges that a US force would potentially face if tasked to conduct stability and support operations in Colombia is within the scope of this monograph.

Three possible scenarios await Colombia in the future: the government can negotiate a political solution with the insurgents, the government can develop a robust counterinsurgency policy to militarily defeat the insurgents, or the government can maintain a status quo that accepts the violent nature of the Colombian society and the political system. President Pastrana (1998-2002) attempted to negotiate with both the FARC and ELN, but these attempts failed because of the FARC's increase in violence and drug trafficking, as well as the lukewarm support of the

Colombian elites and Colombian Congress to fund the increased social programs promised by Pastrasa.[101]

The election of President Uribe in August 2002, combined with increased US support after 11 September 2001, has brought a Colombian government counter-insurgency offensive and civil-legal reform for the near future. Unfortunately, barring a serious geo-strategic invent (e.g. a significant casualty producing terror attack against the US from terrorists in Colombia) the small increase in US involvement will probably not lead to a military defeat of the FARC. The most likely future for Colombia is the maintenance of the violent status quo. Insurgent or criminal groups (fueled by profits from an almost insatiable drug market in North America) in some shape or form will survive not because the Colombia government lacks resources or resolve, but because it cannot agree what is more dangerous to it society—the rampant lawlessness and violence of a failed state run by elites and drug dealing bands protected by violent private armies, or a strong central government, funded by exponential increases in taxation and decreased civil liberties. The complex adaptable system of Colombia, resourced with the constant feedback of demand of illegal drugs in the US and Europe, will continue to exist in this middle ground of complexity.

Final Analysis

The discussion regarding the utility of lines of operations as a planning construct for future complex stability operations is really a portion of a much larger discussion regarding the usefulness of all the elements of operational design. As identified in this monograph, the elements of operational design are essentially the construct or mechanism for the commander and staff to exercise operational art. However, the changing nature of conflict (e.g. Colombia and

[101] The FARC's actions during these negotiations have led many political scientist and Latin American policy experts to re-assess the FARC's claims as a legitimate insurgency. Conventional wisdom among regional experts and senior military in the US is that whatever political aspirations the FARC possessed, they have been polluted by influence of the significant influx of revenue from cocaine production and trafficking. Although the military strength of the FARC has increased to about 25,000, they possess no more than 5% support among the population. In essence, they have become a large illegal gang, capable of manipulating but not changing the political and societal system of Colombia.

Afghanistan) has initiated an argument regarding the relevance of operational art in the future. This dialogue is currently being conducted on the pages of US Army professional journals and periodicals. Key leaders and forward thinkers such as General Montgomery C. Meigs, the former commander of United States Army Europe, and Colonel James K. Greer, the director of the US Army Command and General Staff College's School of Advance Military Studies (SAMS) (2001-2003), have written about the importance of operational level planning and have examined some relevant aspects of concern for future operational level commanders and planners.

General Meigs specifically explains the historical concept of operational art and the requirement for commanders and planners to be adaptable to change practice it his articled titled "Operational Art in the New Century" (*Parameters* Summer 2001). Meigs considers two questions in his analysis: First—what is immutable in operational art? Second—what must the US Army and joint force do to consider new paradigms for the art of operations?[102] The conclusions reached by Meigs are somewhat general (i.e. US Army operational leaders must engage politicians more and leader development must be a premium for the US Army). Additionally, Meigs provides a quality analysis of the elements of operational design and clarifies the linkage of these elements to the vision of the commander and planner; however, he offers no specific new paradigms or models to improve operational level planning.

Colonel Greer goes a step further in an article titled "Operational Art for the Objective Force" (*Military Review* September-October 2002). Greer explains in detail some specific constructs available for future operational level planning (current doctrine, systems and complexity theory, effects-based operations, destroy-dislocate-disintegrate, and the center of gravity [COG] approach). He also believes that the Army must retain the enduring and fundamental capability to attack the mental, moral, and physical aspects of our enemies (nation-states, international terror groups, or large-scale criminal entities that threaten American interest), and he clearly is in favor of a holistic or systems approach to warfare. Greer gets to the core of the problem when he states that: "today's doctrinal concepts for operational design hamstring

planners' and commanders' abilities to design and conduct effective, coherent campaigns for operations across the spectrum of conflict in today's security environment."[103] Greer's work is a great starting point, however, each of the alternate (non-doctrinal) planning constructs requires a separate and thorough analysis to determine if they can ultimately assist or replace current Army planning doctrine.

In contrast to Meigs and Greer, retired US Army Lieutenant Colonel Robert R. Leonhard offers a different view of the future regarding operational level planning and planners. In his article "Factors of Conflict in the Early 21st Century" (*Army Magazine*, January 2003), Leonhard argues that operational art and planning will "wither away in the future" and it will become "so intermixed with political, economic, informational, societal, and cultural factors as to quickly exceed the grasp and authority of regional combatant commanders and their staffs."[104] Additionally, two officers recently attending SAMS consider the future of operational art in written monographs, questioning the relevance of centers of gravity and end state in planning for stability operations.[105]

This disagreement between military professionals and writers is a function of a phenomenon that is occurring in planning and warfighting organizations below the strategic level and is manifested in the operational COAs examined during the case study within this monograph. At the operational level, there exists a cognitive dissonance between the theoretical and practical level of planning. As an institution, the US Army realizes that as technology and human-information interaction increases, current constructs become less effective for planning and executing hyper-complex combat and stability operations. The second portion of the dissonance results from the lack of tools (primarily IT based) that harness the positive aspects of

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[102] Montgomery C. Meigs, "Operational Art in the New Century," *Parameters* (Summer 2001) 5.
[103] James K. Greer, "Operational Art for the Objective Force," *Military Review* (September-October 2002), 23-24.
[104] Robert R. Leonhard, "Factors of Conflict in the Early 21st Century," *Army Magazine* (January 2003), 3.
[105] See MAJ Michael T. Morrissey's "End state: Relevant in Stability Operations?" (Fort Leavenworth: School of Advanced Military Studies, 2002) and Major Lou L. Marich's "Centers of Gravity in OOTW: A Useful Tool or Just a Black Hole?" (Fort Leavenworth: School of Advanced Military Studies, 1995).

nonlinear complexity theory, and through proper application, would increase effectiveness in planning. This similar dissonance was identified among the dual knowledge-centric constructs of Rapid Decisive Operations (RDO) and Operational Net Assessment (ONA) colliding with the lack of fidelity provided by emerging technology (systems and tools) during the US Joint Forces Command Millennium Challenge 2002.[106] Overcoming this dissonance will be one of the most difficult and challenging tasks to face doctrine writers and operational planners well into the next century.

Recommendations

Doctrine

- Lines of operations should remain in US Army capstone doctrine (FM 3-0) in terms of geographical representation of a force and its base of operations. The term logical lines of operations is more a source of confusion than harmony. Logical lines of operations is fundamentally different than geographical lines of operations. It was a mistake to use in FM 3-0 the same term to describe two fundamentally different concepts. Logical lines of operations (as part of the current elements of operational design) should be renamed. A name more suitable is *cognitive operational scheme* or *cognitive operational framework*, which better reflects this approach to planning.

- Regardless if the term logical lines of operations remains in US Army doctrine or not, Figure 5.3 on page 5-9 in FM 3-0, titled "Logical Lines of Operations" needs to replaced with a series of figures that more accurately depicts the concept of multiple, and often disparate, actions arranged in a framework unified by purpose. The actions and objectives need to depict a causal relationship that is both logical (linear) and illogical (nonlinear). The following figures better

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[106] BG Mark P. Hertling, Director for Operational Plans and Joint Force Development; Briefing to SAMS students and faculty on 7 February 2003. Slide 16 specified that: "To be truly effective, ONA requires extensive interagency participation in its development and enabling technologies." Additionally, BG Hertling articulated the Joint Staff recommendation that various governmental and private industry agencies develop "enabling technologies to support ONA initiatives, and begin building operational ONA prototypes."

graphically represents the principles associated with the planning construct of logical lines of operations.

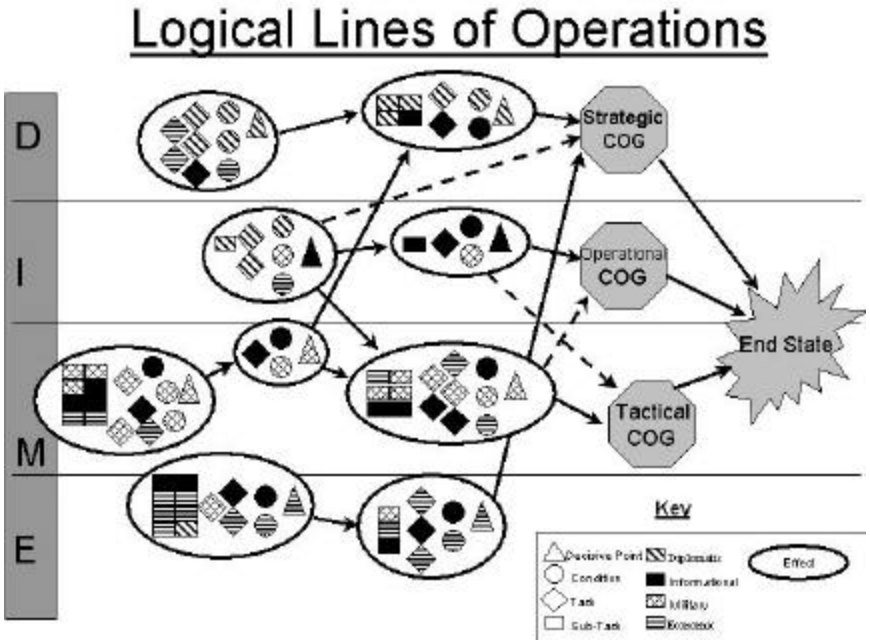

Figure 5-1 Logical Lines of Operations (All Instruments of National Power)

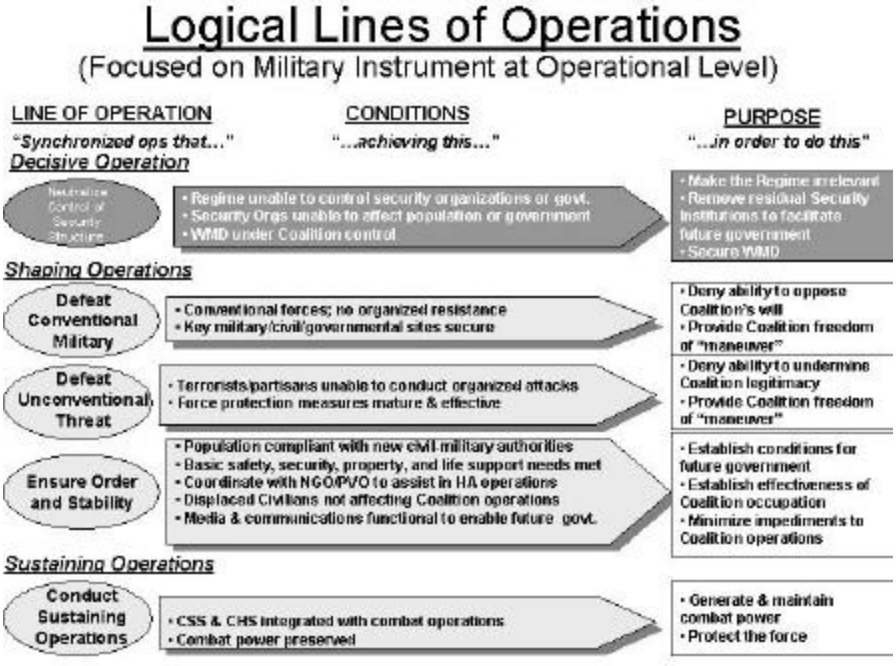

Figure 5-2 Logical Lines of Operations for Planning (Military Instrument)

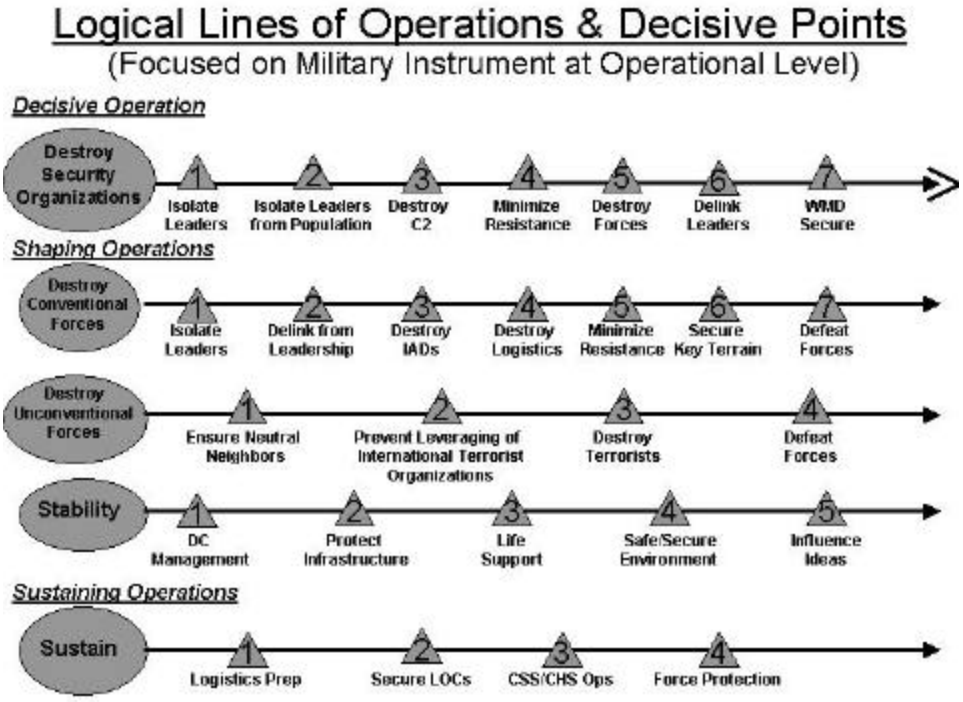

Figure 5-3 Logical Lines of Operations & Decisive Points (Military Instrument)

- US Army SASO doctrine needs to be refined to include nonlinear planning models and alternate techniques. The information contained in Chapter 9 (Stability Operations) and Chapter 10 (Support Operations) is sufficient in detail and scope for a capstone level doctrinal publication. However, FM 3-07 is merely conceptual, aiming at broad understanding rather than at the details of operations. It fails to provide the operational level commander or planner with detailed information regarding the conduct of stability and support operations. Major portions of this doctrinal manual need to be revised to address specific techniques and procedures at the operational level rather than just mere concepts. For example, Chapter 2 (Planning Considerations) should be re-named "Planning for Stability and Support Operations" and should include various but detailed constructs (linear and nonlinear based) for planning. Just as there are multiple COA war game techniques that are explained as part of the Military Decision Making Processes (MDMP), there should also be multiple planning constructs for planners to employ

during different types of operations. Finally, the opening sentence of Chapter 2 (Planning Considerations) in FM 3-07—which reads: "Commanders plan for stability operations and support operations in a similar manner as they plan for the offense and defense"—is incorrect and should be replaced. A more appropriate sentence is: "Commander's and planners plan for stability and support operations in a unique manner and use techniques and constructs that are fundamentally different from offense and defensive operations."[107]

Training & Education

To paraphrase one of the US Army's greatest leaders, President Dwight D. Eisenhower, *plans are useless, but planning is all-important.* The iterative process of executing a notional campaign planning process and/or the MDMP is beneficial in many ways, primarily because it exercises and hones the necessary cognitive and physical skills required during actual combat or operational planning conditions. However, institutionally, the US Army has become infatuated with simplifying the complex. Sound bites, Public Affairs talking points, information themes, and cartoon concept sketches serving as battle plans to orchestrate combat operations laced with detailed complexity, are a few examples. Thinking and planning for complex stability operations is more difficult, requires exceptional rigor and analysis, and cannot be extrapolated down to a few centers of gravity or decisive points. Operational level commanders and planners will rely more and more on what adaptive Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C^4ISR) systems can provide as the US Army recognizes the non-linear nature of military operations. A robust training and education program—equal to if not greater than allocated for operating and interfacing with these improved future systems and technologies—centered on complexity theory and nonlinear thinking must support the fielding of adaptive systems.

Currently, no courses in complexity theory or nonlinear conceptsare offered during the US Army Command and General Staff Officer Course (CGSOC). SAMS is the only officer

[107] FM 3-07, 2-1.

education school to instruct complexity theory and nonlinear concepts regarding warfare. SAMS students receive sixteen hours as part of the core curriculum, with additional four hours offered during an elective. Selected US Army students (about ten per year in the Institutional Support Career Field and Functional Area 49 – Operations Research / Systems Analysis) attend the Naval Post-Graduate School, where two core courses (*Mathematical Complexity Theory* and *Compatibility Theory and Complexity*) are part of the curriculum.[108]

The US Army Combined Arms Center should, in conjunction with the US Army Training and Doctrine Command (TARDOC) Analysis Center (TRAC), incorporate complexity theory and nonlinear thinking in the Officer Education System from the Command and General Staff Officer Course through the Pre-Command Course for all Colonel (O-6) level commanders, TRADOC System Managers, and Program Managers. In the future, where dynamic complexity will drive the preponderance of operations, no senior leader (military or civilian) in the US Army should require a short memorandum or desk-side briefing to explain the nonlinear concepts and emerging complexity theory.

These modest recommendations regarding the doctrine, training, and education that deal with hyper-complex stability operations and non-linear principles will not fundamentally change the US Army's primary mission of winning our nation's wars andmust be consolidated in the mental, moral, and physical domains of conflict. They will however, initiate a cognitive transformation process that will reinforce the US Army's on-going technological and materiel transformation. Complexity theory and the study of non-linearity is still an infant science, but their concepts are eternal and part of the environment of human conflict.

[108] MG David Melcher, Director, Program Analysis and Evaluation Directorate (PAED) Briefing, on PAED, 23 October 2002, West Point, NY; [on-line]; available from https//www.paed.army.mil/fa49/index/html; Internet; accessed 14 January 2003.

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